Set Name side by side	Query	Hit Count	Set Name result set
DB=USPT,PGPB,JPAB,EPAB,DWPI; PLUR=YES; OP=ADJ			
L12	l4 and l11	5	L12
L11	milk same production	12554	L11
L10	l4 and L9	4	L10
L9	l2 and l3	422	L9
L8	l2 and l4	21	L8
L7	L6 and l2	4	L7
L6	l3 and l4	5	L6
L5	l1 and l2 and l3 and L4	3	L5
L4	(sodium adj diacetate) and (sugar)	84	L4
L3	feed adj supplement	3288	L3
L2	lactat$	49350	L2
L1	dairy same animal$	4283	L1

END OF SEARCH HISTORY

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L4: Entry 28 of 32 File: USPT Dec 9, 1975

US-PAT-NO: 3925559
DOCUMENT-IDENTIFIER: US 3925559 A

TITLE: Animal feeds for herbivorous domestic animals

DATE-ISSUED: December 9, 1975

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Glabe; Elmer F.	Northbrook	IL		
Anderson; Perry W.	Niles	IL		
Laftsidis; Stergios	Chicago	IL		

US-CL-CURRENT: 426/2; 426/534, 426/623, 426/807

CLAIMS:

The invention is hereby claimed as follows:

1. A process of feeding herbivorous animals selected from the group consisting of cattle, pigs, horses, sheep, goats and fowl, which comprises feeding such animals with animal feed containing sodium diacetate in sufficient amount to serve as an attractant and to enhance the taste threshhold of said feed, the quantity of sodium diacetate added thereto being within the range of 0.1% to 1.5% by weight of the total feed, and said feed to which said sodium diacetate is added being selected from the group consisting of corn and mixed feeds containing at least 25% by weight of corn.

2. A process as claimed in claim 1 in which said animal is a beef animal.

3. A process as claimed in claim 1 in which said animal is a dairy cow.

4. A process as claimed in claim 1 in which said animal is a pig.

5. A process as claimed in claim 1 in which said sodium diacetate is added to the corn component of said feed while the corn is in the form of whole kernels containing a natural moisture content of 16% to 35% by weight without artificial drying, the corn being allowed to remain in contact with the sodium diacetate until the sodium diacetate has penetrated the seed coat to the endosperm.

6. A process as claimed in claim 5 in which the corn containing sodium diacetate in the endosperm is ground.

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L5: Entry 2 of 3 File: USPT Nov 2, 1982

US-PAT-NO: 4357358
DOCUMENT-IDENTIFIER: US 4357358 A

TITLE: Feedstuff or feedstuff additive and process for its production

DATE-ISSUED: November 2, 1982

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Schanze; Rudolf	D-8430 Neumarkt			DE

APPL-NO: 06/ 175382 [PALM]
DATE FILED: August 5, 1980

PARENT-CASE:
RELATED APPLICATION This application is a continuation-in-part of application Ser. No. 37,775 filed May 7, 1979 now abandoned which itself was a continuation of application Ser. No. 835,593 filed Sept. 22, 1977 (now abandoned).

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
DE	2643093	September 24, 1976
DE	2737295	August 18, 1977

INT-CL: [03] A23L 1/28

US-CL-ISSUED: 426/62; 426/72, 426/623, 426/636, 426/807
US-CL-CURRENT: 426/62; 426/623, 426/636, 426/72, 426/807

FIELD-OF-SEARCH: 426/623, 426/69, 426/624, 426/630, 426/635, 426/636, 426/807, 426/583, 426/454, 426/518, 426/519, 426/72

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected Search ALL

	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
☐	2223904	December 1940	Zentz et al.	426/636
☐	2430797	October 1947	Zenzes	426/636

OTHER PUBLICATIONS

Morrison "Feeds and Feeding", Morrison Pub. Co., 1957, 598-599, pp. 23, 24, 59-60, 83-84, 221-222, 379-381, 397-398, 515-516, 543-544, 550-553.

ART-UNIT: 177

PRIMARY-EXAMINER: Bernstein; Hiram

ABSTRACT:

Animal feedstuffs in pressed form compressed at a pressure less than 700 atmospheres to a bulk density of about 0.3 to about 1.3 g/ml and having a water content from about 8% to about 14% by weight are provided which are based on at least one comminuted, solid, structured, fibrous, agricultural by-product having a preponderance of its fibers of a minimum length of about 1 cm the agricultural by-product having a length of about 10 to about 160 mm, together with at least one digestible, non-structured industrial, non-textured by-product and/or residue with nutrient value. The structured agricultural product in the feedstuff in the pressure form still retains its structured integrity thereby to provide chewability and bite to the feedstuff. The feedstuff preferably is in the form of pellets having a size defined as follows: the diameter of the pellets is between about 14 mm and about 32 mm, the length of the pellets is between about 15 and about 50 mm; and the density of the pellets is between about 0.9 and about 1.3.

19 Claims, 0 Drawing figures
Exemplary Claim Number: 1

BRIEF SUMMARY:

1 BACKGROUND OF THE INVENTION

2 1. Field of the Invention

3 The invention relates to animal feedstuffs in pressed form based on solid, fibrous, agricultural by-products and non-fibrous additives, and to a process for the production thereof.

4 2. Description of the Prior Art

5 The feeding of cereal straw and leguminous straw to ruminants and pigs as ballast or inert material is known. However, since straw has a large volume and its nutritional value is low, it is used only in emergencies for feeding purposes. In recent years agriculture has become greatly restructured. Because, in many cases, cattle raising has been discontinued and cereal and leguminous crops have taken its place, straw occurs in large amounts. The ground conditions are frequently such as to make it almost impossible to plough in all the straw, and the burning of excess straw is becoming increasingly less possible on account of environmental protection reasons.

6 Up till now, straw has not been able to be used in a practical manner as a cattle feedstuff. Morrison, in the textbook "Feeds and Feeding, A Handbook for the Student and Stockman", 22nd edition, Ithaca, N.Y., The Morrison Publishing Company, 1957, suggests that coarse forage is useful as a part of a feed for a ruminating animal since, if kernals of whole grain escape mastication when first eaten, they are brought up for rumination only if entagled in coarse forage. However, straw which consists of the mature stumps and leaves, without the seeds has relatively little protein, starch or fat while the content of fiber and lignin is high, is known to be very much lower in nutritional value than is hay made from the same plants, and also is known to be less palatable than good hay while both hay and straw are useful as coarse forage. Because of the low nutritive value, straw can be useful as part of the ration for animals not being fed for high production. It is much less useful for dairy cows, for fattening cattle or lambs or for calves. Straw is especially unsuited to form a large part of the ration for sheep. In order to make straw more palatable, pulped roots and meal are sometimes mixed with the cut or chaffed straw and the moist mass allowed to soften. To induce animals to eat more straw than they would otherwise eat, it may be sprinkled with diluted molasses. One allegedly

effective feed mixture is oat straw, corn silage and a protein-rich concentrate. Other feed regimens suggested include straw plus cottonseed cake or meal, or straw and alfalfa or other legume hay. The fodder value of straw is limited by the content of lignins, which make it largely impossible to utilize the straw. Methods have been developed for breaking up and decomposing the straw by treatment with strong alkalis. This decomposition process was so technically perfected that the fodder value and digestibility of straw could be raised from a previous value of approximately 35 to 50% to 60 to 70%. The thus broken-down straw has the disadvantage, however, that it is eaten only reluctantly. by cattle. Feed concentrates must therefore be mixed with it in order to make it acceptable to cattle. Straw furthermore has the disadvantage that despite its high content of hydrocarbons, it contains no other nutrients worth mentioning and only some hardly utilizable protein and a few minerals.

7 Straw has the advantage that it satisfies cattle and especially ruminants as a "structure" or fibrous element, as long as its structure remains to a sufficient degree. Furthermore, on account of its carbohydrates, acetic acid formation in the rumen and thus the milk fat production is increased during digestion in ruminants, and preferably in dairy cattle. On account of its particular properties, namely its structure or fibrousness-satisfying ability, and promotion of acetic acid formation, straw has a basic value as a cattle feedstuff.

8 In harvesting feedstuff cereals, especially maize, those parts of the plants that were hitherto discarded with the straw or other waste, such as the fructification parts of the cereal grains or the fallen leaves, are harvested together with the hard seeds in order to retain the structure and the roughage components, and to raise and fully utilize the nutrient value of the plants.

9 This is particularly so in the case of fodder maize recovery. In maize harvesting, the leaf parts covering the maize seeds, the so-called husks, and the fructification parts, the so-called columellae, are harvested and processed together with the seeds. A part of the previously occurring agricultural by-products is thus added as a bonus to the seed mass. The product thereby obtained is termed a maize-husk-spadix conglomerate, or a maize-husk-spadix grist or a maize-columellae mixture, or a maize-collumellae grist, or even as corn-cob-mix (maize seed with columellae and/or involucral leaf or husk). For the sake of simplicity, only the expression "maize-husk-spadix grist" will be used hereinafter. This expression is intended to cover all the aforementioned expressions and also all types of conglomerates and mixtures of parts of the maize plant.

10 The same applies if other types of cereals, e.g., oats, wheat or rye are harvested in a similar manner as described above, so that on harvesting a conglomerate or mixture is obtained which contains, in addition to the seeds, other plant parts such as, e.g., fructification parts or leaves, which were hitherto discarded as straw or other waste residue. Such mixtures of seeds and other plant parts which have been obtained exclusively for animal feeding purposes are termed "feedstuff or fodder cereal mixtures" in the present application. However, these feedstuff mixtures have the disadvantage that their protein content is very low.

11 Flax is one of the oldest fibre and food plants, and even today it is still widely cultivated. Chaff and capsules occur in the recovery of fibres from the flax plant and are in many cases discarded.

12 A large proportion of the citrus fruits produced in the world is not supplied directly to the consumer but is processed in preserving and fruit-juice factories into canned fruit, juice or juice extracts and similar foodstuffs. Bananas are also processed directly by many foodstuff manufacturers. For example, infant foods and dried fruits are often prepared from bananas.

13 Many other types of fruits are also processed in factories to form compotes, fruit salads, dry fruits, juices and similar products.

14 Large amounts of skin, peel, etc. occur in the large-scale processing of citrus fruits, bananas and other types of fruit. The skin, peel, etc. of citrus fruits, bananas and other structured fruit remains were hitherto not processed further since they rapidly become rotten and great difficulty was experienced in disposing of them.

15 Further structured intermediate products which were discarded and not further utilized in the past are the malt sprouts that occur in many areas, especially in malt beer production.

16 It is also known that numerous digestible, industrial, non-structured by-products, after-products and residues having a nutritional value occur, such as for example, whey, protein-enriched residues from milk processing, spent molasses residues or vinasse, other spent material or slops, pulp or trash, .alpha.-cellulose, starch, brewer's yeast, brewer's grains, brewery residues, distillery residues, fermentation residues, dregs, kieselguhr residues, and other residues. All these products are in principle suitable as feedstuffs, but have hitherto hardly been utilized to any significant extent on account of their one-sided nature and their particular properties.

17 In the decomposition of milk into high value human foodstuff products, by-products occur such as for example rennet whey in cheese making. Rennet whey is processed in large amounts into unfermented whey powder. However, many after-products that are difficult to dispose of also occur in addition to rennet whey. In the production of curds, high lactic acid wheys are formed, and wheys from which the sugar and protein have been removed are formed in milk sugar production and lactose recovery. In addition there are the residues from modern, biologically milk processes, such as from ultrafiltration, reverse osmosis and electrodialysis. Such after-products are difficult to use.

18 German Patent Specification No. 1,492,787 describes a process for the production of feedstuffs, in which sour whey and/or buttermilk is used as the milk processing product. In this known method protein-containing, carbohydrate-enriched and/or fat-rich additives are added in gel form to the acid whey and/or buttermilk. In the feedstuff thereby obtained the proportion of protein-containing, carbohydrate-rich additives is no longer in a structured form and accordingly the degree of satisfaction of this feedstuff is insufficient. High lactic acid or hydrochloric acid wheys can be processed and utilized only by using special methods and procedures (see German Patent Specification No. 1,492,787).

19 Numerous residues also occur in sugar production, wood production, brewing processes and distilling processes, and also in fermentation processes, which are difficult to remove but which basically have some nutritional value and accordingly could be used as feedstuffs.

20 It is also known that glutamic acid or citric acid can be recovered from molasses, i.e. residues from the sugar industry, spent molasses wash or vinasse remaining, this residue is in principle also suitable as a feedstuff.

21 Save-all substance or "trash" occurs in the processing of wood. This is pure .alpha.-cellulose, suitable as a feedstuff which could be fed to ruminants with the same success as starch. However, in practice it is not possible to feed save-all substance or trash to ruminants since the moist, crumbly product is neither palatable nor easily processible. It is therefore burnt or transported at great expense to refuse dumps.

22 Brewer's yeast, brewer's grains, dregs and kieselguhr residues occur in large breweries. In many cases these are high value feedstuffs but cannot be used in the normal way for feeding purposes on account of their high residual moisture content.

23 The afore-described, solid, structured, agricultural by-products and the likewise afore-described digestible, industrial, non-structured by-products, after-products or residues or residues having a nutritional value are:

24 (1) in principle suitable as feedstuffs, but are one-sided substances and thus need to be substantially augmented and structured in an animal-oriented manner;

25 (2) can be used in small amounts as feedstuffs in the traditional manner, but no longer in the present-day regional and local accumulations, and are accordingly an environmental problem;

26 (3) can no longer be finally improved or refined or converted into usable end products in plants situated at their point of production; and

27 (4) can be converted into end products at the point of their production only by using an enlarged and specialized plant. The additional expenditure thereby incurred is, however, no longer covered by the possible market proceeds from the end product, and losses therefore arise.

28 There are many patents which suggest modified animal feeds. Thus, U.S. Pat. No. 3,840,670 patented Oct. 8, 1974 to Fermented Products Inc. suggested culturing whey with Lactobacillus bulgarium and Lactobacillus acidophilis; combining it with corn germ meal; and aerating and curing the fermented product to provide a non-hygroscopic free-flowing, self-preserving animal feed supplement.

29 U.S. Pat. No. 554,913 patented Sept. 22, 1925 by W. P. M. Grelch provides a self-preserving wet food product of mallet grain including the sprouts in fresh undried state and impregnated with a preservative quantity of lactic acid.

30 U.S. Pat. No. 2,430,797 patented by A. M. Zenzes provides a dry-to-the-touch non-fibrous food involving comminution of dry fibrillous food material to great fineness.

31 U.S. Pat. No. 4,015,018 patented Mar. 29, 1977 to Food Technology Products provides an ensilaged animal feed from a forage crop which has been chopped into small pieces, along with sodium diacetate and dehydrated whey.

32 U.S. Pat. No. 2,363,730 patented by Nicholas L. Simmons provides a food material containing a protein and hydrolyzed whey.

33 U.S. Pat. No. 2,223,904 patented Dec. 3, 1940 by M. Zentz et al provides a compressed fodder from vegetable raw materials compressed at a high pressure of about 700 to 1500 atmospheres.

34 U.S. Pat. No. 2,173,922 patented Sept. 26, 1939 by The Borden Company provides dried whey including therein an organic water-insoluble non-gelatinized substance.

35 U.S. Pat. No. 1,555,246 patented Sept. 29, 1925 by W. P. M. Grelch provides a self-preserving food product from milk, steeping grain hulls and lactic acid.

36 British Pat. No. 406,403 of Emil Heller provides an animal feed including chopped straw, crude crystallized sugar, molasses and ordinary dry fodder.

37 British Pat. No. 1,361,266 patented by Eltsac Feeds Limited provides an animal feed from calcium hyroxide, a feeding stuff meal, and molasses.

38 British Pat. No. 1,317,003 patented by Secko Malsuoki provides an animal feed from cellulosic feedstuffs by treating them with the enzyme lignione.

39 British Pat. No. 1,139,136 patented by L. B. Heesen et al provides a composite forage in pellet form grounds and/or seeds which are so crushed that the starch components are pulverized but the cellulosic compound is broken into pieces.

40 British Pat. No. 877,691 patented by James & Co. (Hungerford) Limited provides a feedstuff made of suger, a meal made from immature herbage, a high protein content material and dried distillery concentrate.

41 British Pat. No. 532,247 patented by Naamlooze Vennootschap provides a foodstuff of comminuted different vegetable products.

42 Canadian Pat. No. 788,936 patented July 2, 1968 by Cargill Inc. provides a pelleted mineral feed involving the use, as a binder, of spent sulfite liquors.

43 Australian Pat. No. 4828-26 is directed to a process for making fodder consisting in mixing ground maize stalks (rachis) with wet brewery residue. According to this patent "flour" produces from the stalks is used. The maize stalks can also be grounded to groats or flakes. This flour of maize stalks is then impregnated with beer wort contained in spent malt. The fodder obtained is a paste and does not have any bite. It is known that flour or flakes or groats easily absorb moisture and liquid.

44 Australian Pat. No. 4829-26 is directed to a process for making useful products from sugar cane. The ripe sugar cane contains about 29 to 34% by weight solids and 60 to 71% by weight water. In the normal working up about 10 to 11% sugar is removed so that approximately one third of the solid is used and about two thirds of the solid is wasted. To use this material, it is ground so that it can be used directly as fodder. The ground product may be subjected to a sifting process since only the small particles are rich in sugar. This patent, therefore, aims to use the sugar as contained in the sugar cane. After the grinding it is necessary to carry out a heat treatment so that one obtains more tasty compounds. One obtains three sections. The finest meal constitutes a valuable good fermentation agent and baking powder for bakeries and it can be used for different purposes. The second section may be used as fodder, either alone or mixed with normal fodder substances. In order to make the product more stable it is possible to add maize cobs deprived of grains to it.

45 Australian Pat. No. 7813/27 is directed to a fodder which can be used for cattle and/or sheep in time of draught. The fodder comprises a relative large portion of a selected roughage, among others corn stalks or straw, and a relatively small portion of materials high in digestible proteins. The fodder comprises:

desicated sorghum	100 parts	(or 71%)
molasses	5 parts	(2.9%)
lucerne meal	25 parts	(17.9%)
corn meal	5 parts	(3.6%)
cotton seed meal	2.5 parts	(1.8%)
meat meal	2.5 parts	(1.8%)

46 The product thus comprises 6.2% digestible protein and 34.6% digestible carbohydrate.

47 Australian Pat. No. 8800/27 relates to an artificial food for farm stock. This fodder comprises a meal of prickly pear spines and substantially creamless milk, e.g. skim milk or separated buttermilk. Skim milk or buttermilk as used in this fodder are valuable products with nutrive value which are fodder as such. The prickly pear spines are cut and dried in the air. They afterwards are ground. The ground material is mixed with the skim milk or buttermilk and one obtains a paste. This pasty composition does not have any bite.

48 Australian Pat. No. 21,770/29 is directed to the manufacture of artifical foods for farm stock. Fish meal and prickly pears are mixed to obtain a dry food product.

49 Since the prior art as noted above is deficient, the main object of the present

invention is thus to provide animal feedstuffs and a process for their production, in which the aforementioned products, which occur in large amounts, which are easily procured, and which can in principle be used as feedstuffs, are employed. In this connection, the substances are intended to have an optimum utilization by the cattle, so that the costs involved in the production of animal food products, e.g., milk and meat, can be lowered, and also the costs for removing and eliminating such residues can also be decreased.

50 The feedstuff according to the invention is intended to have a high satisfaction value and at the same time to be readily accepted by cattle.

51 SUMMARY OF THE INVENTION

52 (i) Aims of the Invention

53 An object of this invention then is the provision of an animal feedstuff in pressed form based on solid, structured agricultural by-products and additives.

54 Another object of this invention is the provision of a process for producing such animal feedstuffs.

55 (ii) Statement of Invention

56 This invention thus provides an animal feedstuff in pressed form compressed at a pressure less than 700 atmospheres to a bulk density of about 0.3 to about 1.3 g/ml based on solid, fibrous, agricultural by-products comprising: (a) from about 25% to about 95% by weight dry matter of at least one comminuted, solid, structured fibrous agricultural by-product, having a low nutritional value and, to provide structure selected from the group consisting of cereal straw, leguminous straw, maize columellae, maize-husk-spadix grist, feedstuff cereal mixture, flax plant chaff, flax plant capsules, fibrous fruit peel, fibrous fruit skin and malt sprouts such agricultural by-product having a length of about 10 to about 160 mm; and (b) from about 75% to about 5% by weight dry matter of at least one digestible, non-structured industrial by-product or residue with nutrient value, selected from the group consisting of whey, (preferably unpasteurized) protein-enriched residues from milk treatment processes, molasses residues, vinasse, .alpha.-celluloses, starch, brewer's yeast, brewer's grains, brewing residues, distillery residues, fermentation residues, dregs, kieselguhr residues, chitin; the feedstuff in such pressed form having a moisture content of about 8 to about 14% by weight; the structured agricultural by-product in the feedstuff in the pressed form still retaining its structured integrity thereby to provide chewability and bite to the feedstuff.

57 This invention also provides a process for the production of an animal feedstuff from solid, fibrous, agricultural by-products, the process comprising the steps of: (a) intensively mixing (i) from about 25% to about 95% by weight dry matter of at least one comminuted, solid, structured fibrous agricultural by-product having a low nutritional value and a length in the range between about 10 and about 160 mm to provide structure, selected from the group consisting of cereal straw, leguminous straw, maize columellae, maize-husk-spadix grist, feedstuff and cereal mixture, flax plant chaff, flax plant capsules, fibrous fruit peel, fibrous fruit skin and malt sprouts, with (ii) from about 75% to 50% by weight dry matter of at least one water-containing, digestible, non-structured industrial by-product or residue with nutrient value, selected from the group consisting of whey, (preferably unpastureized), protein-enriched residues from milk treatment processes, molasses residues, vinasse, molasses residues, .alpha.-cellulose, starch, brewer's yeast, brewer's grains, brewing residues, distillery residues, fermentation residues, dregs, kieselguhr residues, and chitin; (b) partially drying the mixture thereby obtained to a moisture content of about 8% to about 14% by weight; and (c) processing the mixture into a compressed product by compression at a maximum pressure of 700 atmospheres, to provide a pressed pellet of bulk density of 0.3 to 1.38 g/ml and a moisture content of about 8 to about 14% by weight in which the structured integrity of the agricultural

by-product is maintained; thereby to provide chewability and bite to the feedstuff, so that the feedstuff is adequate for ruminating process.

58 (iii) Other Features of the Invention

59 By one feature of this invention, the pressed feedstuff is in the form of pellets, the diameter of the pellets being between about 14 mm and about 32 mm; the length of the pellets being between about 15 mm and about 50 mm; and the density of said pellets being between about 0.8 and about 1.3.

60 By another feature of this invention, the pressed feedstuff is in the form of pellets, diameter of said pellets being between about 18 mm and about 24 mm; the length of the pellets is between about 25 mm to about 45 mm; and the density of the pellets is between about 0.7 and 0.85.

61 Another feature of this invention is the provision of such feedstuff wherein component (a) comprises cereal straw; and wherein component (b) comprises whey.

62 By another feature, the animal feedstuff is one wherein component (a) comprises from about 25% to about 85% by weight dry matter of at least one material selected from the group consisting of cereal straw and leguminous straw; and wherein component (b) comprises from about 75% to about 20% by weight dry matter of by-product whey.

63 By another feature, the components (a) and (b) are so selected that the animal feedstuff comprises:

straw	35 to 50% by weight dry matter
low lactose, protein-enriched whey	15 to 36% by weight dry matter
a digestible, industrial by-product or residue with nutrient value selected from the group consisting of .alpha.-cellulose and chitin and mixtures thereof	2 to 10% by weight dry matter
vinasses	2 to 10% by weight dry matter
non-dried brewer's grains	20 to 35% by weight dry matter
mineral substances	2 to 5% by weight dry matter
and conventional additives selected from the group consisting of antibiotics, enzymes, hormones, trace elements, vitamins, pharmaceuticals, and preservatives and mixtures thereof	up to 2% by weight dry matter

64 By a still further feature of this invention, the fibrous fruit peel is selected from the group consisting of citrus fruit peel and banana peel, and mixtures thereof.

65 By yet another feature, the animal feedstuff further includes about about 5% to about 20% by weight dry matter of concentrated brewer's yeast and about 1% to about 4% by weight dry matter of a compound selected from the group consisting

of fats and fatty acids and mixtures thereof.

66 By another feature of the process of this invention, the processing step comprises compressing the partially dried mixture under moderate pressure, thereby to provide an animal feedstuff in pelleted form, the diameter of said pellets being between about 14 mm and about 32 mm; the length of the pellets being between about 15 mm and about 50 mm; and the density of the pellets being between about 0.8 and about 1.3.

67 By a further feature, the diameter of the pellets is between about 18 mm and about 24 mm; the length of the pellets is between about 25 mm to about 45 mm; and the density of the pellets is between about 0.7 and 0.85.

68 By still another feature, the processing step is carried out by the combination of a metering screw and a press where the partially dried material is formed into compressed fodder at moderate pressure substantially less than 1000 atmospheres.

69 By another feature of the process of this invention, the process is carried out wherein step (a) comprises: intensively mixing (i) about 25% to about 80% by weight dry matter of at least one material selected from the group consisting of cereal straw having a length of about 120 to 160 mm and leguminous straw with about 75% to about 20% by weight of by-product whey; wherein step (b) comprises: partially drying the mixture thereby obtained; and wherein step (c) comprises: compressing the mixture into an animal feedstuff while essentially retaining the length characteristic and structured integrity of said fibrous cereal straw or legumous straw.

70 By another feature, the partial drying step is carried out in a green fodder drying plant.

71 By a further feature, the partial drying step is carried out in a slurry drying plant.

72 By yet another feature, the process includes the step of adding sufficient water prior to or during step (a) to ensure intensive mixing of the fibrous by-product and the other by-product.

73 By still another feature, the process includes the further step prior to or during step (a) of the addition of chitin.

74 It has surprisingly been found that, in order to provide an animal feedstuff that has the necessary "bite", it is necessary to use a structured fibrous ingredient having a fibrous length of about 1 to about 16 cm formulated and processed in such a way that its structured integrity is maintained. Thus, while in the past feedstuffs were known which included, e.g., straw or maize husks, such structured fibrous materials were ground so that they lost their structured integrity. Such ground material is thus a non-structured material and absorbs a liquid. Such a material, when fed to cattle, would form a sludge or suspension and so the feedstuff would have no bite. On the other hand, it has surprisingly been found that a feedstuff having a comminuted structured fibrous material of a length of at least 1 cm must be chewed by cattle, i.e., cattle are forced to bite it. Thus, it has been found that for proper feeding of cattle, the feed should contain a structured fibrous material whose structured integrity is maintained since such material is needed for their rumen. All such materials in the prior art have been ground. A granular material having a particle size of up to 0.9 cm is not regarded in this art as structured.

75 It has also been surprisingly found that the animal feedstuff containing about 25% up to preferably about 40% by weight of such structured ingredient can be compacted without great pressure, i.e. a pressure substantially less than about 1000 atmosphere. It had been known in the past that straw, having a bulk density of 0.1 g/ml could only be compacted under very great pressure. The animal feed of this invention compacted under moderate pressure preferably has

bulk density of 0.3-0.7 or 0.5 to 0.6 g/ml.

76 In the present invention, the pellets generally have a diameter of between about 14 and about 32 mm, preferably between about 18 and about 24 mm. Their length is generally between about 15 and about 50 mm, preferably between about 25 and about 45 mm. The density of the pellets depends on the proportion of the amount of structured fibrous material to the unstructured nutrient material. Generally it is between about 0.8 and 1.3, with the greater proportion of structured fibrous material resulting in a higher density. With pellets of diameter of about 30 mm with a thickness of about 20 mm (between about 15 mm and about 30 mm depending on the amount of structured fibrous material), the density is about 0.7 to about 0.85.

77 It has also surprisingly been found that the proportion of moisture in the partially dried mixture, of about 8% to about 14% by weight, is critical. Should feed containing less than about 8% water be compressed, it quickly becomes too dry and too dark, in addition to being too compact through compression. In other words, it acquires an undesirable woodlike structure. Compressed pellets containing more than about 14% water tend to disintegrate due to the high humidity and possess insufficient storage consistency. Pellets having between about 14% and about 18% water content are too soft, and begin to disintegrate during transportation and handling. Should the feed have more than 18% water, it cannot be compressed under moderate pressure to form pellets and wet crumbs are the result.

78 The above is especially true of pellets containing structured straw. For compressed power feed, i.e., nutritive concentrates, the permissible values for water content are different; for instance, alfalfa pellets having about 18% water still hold together.

79 The structured integrity of the structured fibrous ingredient is thus of intrinsic essential importance in the animal feed of this invention.

80 If one is to consider power feed for milk producing animals and bulls, there are two problems:

81 (a) the feed volume to be ingested by the animal must be so large such that additional necessary power feed is contained in that volume, i.e., the feed must be in accordance with the quantitative and qualitative requirements for its nutritional value; and

82 (b) since in ruminating animals the feed first lands in the rumen to be broken down by microorganisms, the feed must be balanced in energy, egg white, mineral particles, etc., such that later on the feed value leaving the rumen is sufficient to cover the needs of the animal. In other words, the feed must be adequate for ruminating animals.

83 In order to satisfy this requirement, the animal feed must possess structure to require the animal to chew the feed.

84 As Morrison (see above) also states, this structure in the feed is achieved within the ratios by means of roughage, which, however, is nutrtionally poor, as with hay and silage. Thus, where performance is a factor, the nutritional value of a power feed, i.e. a feed concentrate, must be provided.

85 Structured feed, and particularly straw-containing feed, is converted in the rumen towards acetate, which yields milk fat. Power feed having large amounts of easily digestible carbohydrates and egg whites is converted towards propionates which yields milk sugars (milk or meat). This latter process however, occurs only when there is sufficient structure in the feed, which leads to rumination, (i.e., mixing with saliva, and pH-raising via saliva-sodium bicarbonate). Otherwise, the pH value in the rumen sinks, and disturbances of the metabolism results.

86 For milk performance, it is necessary that the raw fiber content be somewhere

between about 20 and about 22% of the dry weight. Under no circumstances should it fall under about 18%. The ratio of acetic acid to propionic acid of about 3 to about 1 in the rumen, which is necessary for good milk and fat performance, is thereby achieved. The limit of about 18% precludes the idea of feeding cattle exclusively or primarily highly digestible power feed. Especially for high milk performance, it is necessary to maintain the limit of about 18%. The feeds taught by Morrison do not satisfy this requirement.

87 The physical structure of the roughage feed should be bulky, glumaceous and coarse in fiber. This stimulates the cow to ruminate intensively, thereby aiding the production of saliva. The latter again is necessary to neutralize the over-produced acid in the rumen of the cow due to the use of too much power feed. To date, there are no unequivocal values for the required structure. It is well known, however, that without structured feed, a cow cannot be kept healthy and performing highly.

88 The essential characteristic of the present invention is that the straw is treated in such a manner as to keep its structure intact. Since straw alone is difficult to process, and is much too voluminous, it is, according to the present invention, complemented with a non-structured material. The nutritional value is thereby heightened, as well as the technological ability to be handles for compression. The resulting feed possesses the up-till-now separate characteristics of a structured feed (roughage) and a power feed (nutritive concentrate) simultaneously. This is the key characteristic of the present invention apart from the fact that the desirable goal that waste by-products are recycled is achieved.

89 The animal feedstuff according to the invention is suitable for all types of animals. As noted above, it is preferably fed to ruminants, but can also be used to feed horses, pigs, animals in zoos and game, especially in wintertime.

90 The animal feedstuff according to this invention can be fed directly as such or can be added as a feedstuff additive to normal feedstuffs. If the animal feedstuff according to the invention is used as a feedstuff additive, it can be mixed with low protein or high protein feed concentrates or with basic feedstuffs, e.g., hay, dry scraps, molasses, potatoes, etc. If the feedstuff additive according to the invention is used together with other feedstuffs, its amount can be varied depending on the specially used feedstuff and the given fodder requirements. When used as a feedstuff additive, it can be admixed in any arbitrary amounts. When used to complement basic feedstuffs, the feedstuff according to the invention is generally mixed with the basic feedstuff in amounts of about 20 to about 60%, preferably about 20 to about 50% by weight referred to the total dry mass. If the animal feedstuff according to the invention is used together with feedstuff concentrates, its amounts may vary widely and lie in the range of about 10 to about 90% by weight, preferably about 20 to about 70 and most preferably about 20 to about 50% by weight referred to the feedstuff concentrate.

91 The animal feedstuff according to the invention thus contains as the solid, structured, fibrous agricultural by-product, the comminuted, special length fibers of cereal straw, leguminous straw, maize columellae and the like, maize-husk-spadix grist, fodder cereal mix, chaff and capsules from the flax plant, citrus fruist peel, banana peel, other structured fruit residues, malt sprouts or mixtures thereof, and as the digestible, industrial, non-structured by-products, after-products or residues with nutrient value, whey, protein-enriched residues from milk processing, molasses residue slops or vinasse, other slops, save-all substances or trash, .alpha.-cellulose, starches, brewer's yeast, brewer's grains, brewing residues, distillery residues, fermentation residues, dregs, kieselguhr residues, chitins, or mixtures thereof. The composition of the feedstuff is thus governed by the local conditions. The feedstuffs generally contain about 25--about 95% by weight of structured by-product and about 75 to about 5% by weight of non-structured product.

92 In the animal feedstuffs which contain cereal straw, leguminous straw, maize

columellae or mixtures thereof as structured product, the solid, structured, agricultural by-product is present in amounts of about 25 to about 80% by weight, preferably about 30 to about 80% by weight, and most preferably about 30 to about 65% by weight. The digestible, industrial, non-structured by-product, after-product or residue with nutrient value is present in amounts of about 75 to about 20% by weight, preferably about 70 to about 20% by weight and most preferably in amounts of about 70 to about 35% by weight. All the above amounts refer to the dry compositions. If less than about 25% by weight of solid, structured, agricultural by-product, for example, cereal straw or leguminous straw is used, the fodder can only be produced in a complicated manner, and if more than about 80% by weight of cereal straw, leguminous straw or maize columellae are used, the nutrient value of the fodder is not sufficient.

93 The feedstuffs according to the invention, which may contain as the solid, structured, fibrous special fiber length by-product, maize-husk-spadix grist and/or a fodder cereal mixture and/or chaff and capsules of the flax plant and/or citrus fruit peel and/or banana peel and/or other structured fruit residues and/or malt sprouts, alone or mixed with the aforementioned structured, fibrous by-products, contain about 25 to about 80% by weight of solid, structured, agricultural by-product and about 75 to about 20% by weight of digestible, industrial, non-structured by-product, after-product or residue with nutrient value, but preferably contain about 55 to about 95% by weight, referred to the dry mass, of maize-husk-spadix grist or fodder cereal mixture, alone or mixed with the other mentioned structured by-products and about 45 to about 5% by weight of the non-structured by-products and/or residues. All percentages by weight refer to dry proportions.

94 The solid, structured, agricultural by-product, e.g., straw, is present in comminuted and fibrous form in the animal feedstuff according to the invention, and generally has a length of between about 10 and about 160 mm, preferably about 90 to about 20 mm and below. In the pellets of the invention the structured integrity of the straw must be maintained.

95 GENERALIZED DESCRIPTION OF EMBODIMENTS

96 In the following tables, the lengths of the comminuted fibers and weight ratios are given using the example of straw, and are obtained by using various comminution devices.

Lengths of comminuted fibers and weight ratios for straw

Comminution System	Greatest Lengths mm	%	Average Lengths mm	%	Smallest Lengths mm	%
Chopper for green material	400	15	250	40	150	35
Chopper for green material, rebuilt	130	30	70	40	30	30
Plane disc mill (according to the pre-chopper, which was rebuilt for green material)	90	5-10	50	20-30	20	75-6
Special apparatus "Tubgrinder" (hammer mill)	50					

10 20-30
70 20 20

---

97 The animal feedstuffs according to the invention may, for example, contain fibrous citrus fruit peel, for example, from grapefruit, mandarins, lemons, limes, oranges, or bitter oranges.

98 The animal feedstuffs according to the invention may, as previously mentioned, also contain chitins. As used herein in the present application, chitin is intended to refer to a digestible, industrial, non-structured by-product, after-product or residue. The shells, i.e., the outer skeletal structure of, for example, crabs and insects, and also the cell walls of algae, yeasts, fungi and lichen consist of chitin. Chitin also occurs in krill. Chitin from all sources can be used in the feedstuffs according to the invention. However, chitin produced in the processing of krill is preferably used.

99 A preferred feedstuff contains straw, whey and krill residues.

100 The animal feedstuffs according to the invention may furthermore contain up to about 5% by weight referred to the dry composition of solid, structured, agricultural by-product and digestible, industrial, non-structured by-product, after-product or residue with nutrient value, conventional additives, e.g., antibiotics, enzymes, hormones, trace elements, minerals, vitamins, pharmaceuticals, preservatives or mixtures thereof. Additives which may be used are, for example, all those described in Ullmann's Encyclopaedia, Volume 7, pages 731 ff. They may also contain preservatives. e.g., propionic acid and derivatives thereof.

101 A preferred basic feedstuff system according to the invention contains, expressed as dry matter in the end product:

Highly comminuted straw	about 25 to about 75%
Low lactose content and protein-enriched (ammonium compound) unpasteurized whey or another milk residue	about 75 to about 25%

102 Other water-containing residues can be used with this basic feedstuff system. A further preferred feedstuff system according to the invention contains, also expressed as dry matter in the end product:

Highly comminuted straw	about 35 to about 50%
Low lactose content and protein-enriched (ammonium compound) whey	about 15 to about 36%
Save-all and trash substances, preferably .alpha.-celluloses and/or chitin	about 2 to about 10%
Vinasses (also with adhesive effect)	about 2 to about 8%
Brewer's yeast, preferably concentrated brewer's yeasts	about 5 to about 20%
Undried brewer's grains	

about 20 to about 35%

103 The following may be added as further additives to this feedstuff system, likewise expressed as dry matter in the end product:

Fats and fatty acids	about 1 to about 4%
Mineral substances	about 2 to about 5%
Vitamins and/or other active substances	up to about 2%

104 In the implementation of the process according to the invention, the necessary amounts of cereal straw, leguminous straw, maize columellae or their mixtures are comminuted to the given lengths in suitable apparatus as described above. The non-structured by-products, after-products or residues with nutrient value, which are present in liquid, moist or crumbly form, may be added to the solid, structured, agricultural by-product before or after the comminution. However, these materials can be added to the comminution apparatuses, intermittent mixing thereby taking place simultaneously in the comminution apparatus. Thus, whey or other low lactose content, protein-enriched milk residues can be added to the comminution apparatus. If the non-structured by-products, after-products or residues are present in liquid form, they can also be sprayed into the solid, structured, agricultural by-product or dispersed therein after the comminution. The mixing of the two feedstuff constituents is critical and must be carried out intensively, since the strong adhesiveness or stickiness of the non-structured liquid residues that sometimes occurs must be reduced to such an extent, either by mechanical incorporation into the structure phase, or by a sufficient residence time in transportation for penetration into the structure phase to take place, that formation of deposits in the drier is avoided or is kept within tolerable limits in the subsequent drying process.

105 This is achieved in accordance with the invention if, when using green drying plants and with less intensive mixing, the comminution and mixing is displaced forwardly in the direction of the transporting means so that an infiltration is made possible by the thereby achieved longer transportation times in the conveying devices and by appropriately regulating the amounts.

106 Alternatively, this is also achieved by special apparatuses, for example, plane disc mills, which are able simultaneously to cut into fibers coarse, pre-cut structures residues, and intimately mix them with liquid residues, with the result that a time-saving effect comparable to the penetration action is obtained in this way.

107 The time for the penetration should be at least about 10 minutes. This time corresponds to the conveying path in conventional green drying plants which are regulated to operate with the highest throughput. The passage of the mixture through the conveying path is, however, preferably about 15 to about 25 minutes, which can be taken as a prerequisite with normal throughputs.

108 If smaller amounts of structured, agricultural residues (straw, etc.) and larger amounts of non-structured components are used, the penetration period or the mixing intensity can be raised. This is also the case if the adhesiveness of the liquid additives, for example with vinasses or wheys that are still too rich in lactose, is decidedly high.

109 In the case of very high unavoidable adhesiveness of the liquid additives (high sugar content in the molasses or wheys), it is preferred to use structured and non-structured products by means of which the adhesiveness will be reduced, e.g., maize columellae and .alpha.-cellulose-containing, fine fibred products

or chiin-containing products and brewer's grains and brewer's yeasts.

110 The milk residues, especially wheys, can also be strongly decomposed into lactic acid via fermentation, whereby their protein content can simultaneously be substantially increased by ammoniation. In this way the adhesiveness is also indirectly reduced and the processibility is facilitated.

111 The mixture is then partially dried to the required moisture content of about 8 to about 14% by weight in a conventional drying plant for grass, green maize or other green material, and processed in a manner known per se into compressed fodder or compressed fodder additives, which can be sent directly to the consumer.

112 Grass and/or green drying plants are widely distributed in natural pastureland regions or areas with natural pastureland and arable land regions, since in the past few decades the artificial drying of green fodder has achieved considerable importance. The normal plants are arranged so that the usual green material, e.g. meadow and pasture growth, green cereals, green maize, etc. can be taken in, and the soft material may optionally be comminuted and dried in an efficient manner. The initial water content of the green material of about 60 to about 80% is reduced to a residual water content of about 12 to about 14%, and this dried green product is then processed into compressed fodder.

113 It is a substantial advantage of the process according to the invention that the mixture of comminuted, solid structured, agricultural by-product and digestible, industrial, non-structured by-product, after product or residue with nutrient value can be further processed, i.e., dried and compressed in such special plants for drying green fodder.

114 The water content of the mixture is reduced in the process according to the invention in the green drying plant to a residual content of approximately 8 to about 14% by weight, preferably about 10 to about 12% by weight. The residual moisture is governed by the local factors and the water content of the starting mixture.

115 The water content of the mixture before it has been dried is considerably reduced compared with the green material usually processed in green drying plants (which on average contains between about 60 and about 80% water), and is on the average between at least about 20 and at most about 60%, and preferably between about 25 and about 40%. The burner settings and the air intake are adjusted to these values, which can easily be accomplished in the units by changing to nozzles with a smaller heating medium throughput and reducing the ventilator performance.

116 The residual moisture of the end product obtained in the green drying plants, for example in the case of green cobs, is on average in the range from about 10 to about 18% by weight, preferably between about 12 and about 15% by weight. The residual moisture of the end product obtained by the process according to the invention and having the compositions according to the invention is found in practice to be somewhat lower, on average between about 8% and about 15% by weight, preferably between about 8% and about 12% by weight.

117 After the material has been dried, it is separated from the air in a separator, for example in a cyclone. The dried material generally has a temperature of about 75 to about 90.degree. C. at the outlet, and is conveyed via transporting and metering screw devices to a press where the dried material is formed into compressed fodder, in general into compact bodies of solid shape, and uniform cross-section and varying length. The smaller of these bodies are termed "pellets", bodies having an average diameter of about 10 to about 30 mm are called "cobs" and larger bodies are termed "briquettes". The compacted animal feedstuff according to the invention can be stored for a long time without decomposing.

118 A substantial disadvantage of the known green drying plants is that in the past they could only be used in the "green" season, i.e., from May to October. This

utilization period of only half a year is a disadvantage since the fixed costs over the whole year have to be borne by half a year's production.

119 Green drying plants could not be used hitherto for processing straw and liquid, non-structured raw materials. It has surprisingly now been found that by suitably choosing the structured by-products and the non-structured by-products, after-products or residues, and by suitably choosing the weight proportions, mixtures are obtained which can undergo green drying and can provide a high quality, competitively priced compressed fodder.

120 In the present invention, low value residues from the milk industry are preferably used in the liquid phase. Particularly suitable are high lactic acid wheys, other highly acidic wheys and lactose molasses having a high acid content. If such materials are not present, acidification can be achieved by introducing lactic acid cultures, e.g., as are used in cheese making. In this way a high acid content and a correspondingly low lactose residue content are obtained. These wheys and residues are then neutralized with ammonia, whereby ammonium lactate or other ammonium compounds are obtained which serve as a NPN source and as protein enrichment for the end product.

121 A product produced from comminuted straw and protein-enriched, concentrated whey with reduced lactose content is particularly suitable for ruminants.

122 A preferred feedstuff according to the invention consists of about 25 to about 80% of cereal straw or leguminous straw and about 75 to about 20% of whey, referred to the dry matter. In the production of such a feedstuff, two problems may arise, namely that (a) sufficient amounts of straw cannot be procured, or (b) sufficient amounts of low value wheys cannot be obtained. Molasses residue slops, brewer's yeast, brewer's grains and other brewing residues, and slops and spent washes of all types can be used as a substitute for the missing whey.

123 In a further embodiment, strongly curd acid, post-acidified curd whey is used as starting material. These wheys can be artificially post-acidified by adding lactic acid-forming compounds, or sweet wheys and rennet wheys can be converted into lactic acid wheys by adding lactic acid-forming agents.

124 The fermentation by lactic acid-forming agents up to a maximum of about 18% dry substance in the whey substrates can be carried out in the existing tank capacities. This can be carried out by a prior concentration of the whey overall, but can also be carried out by blending with higher concentrations and untreated wheys. Curd acid, rennet sweet wheys can also be mixed with concentrated lactose molasses and permeat material from filtration and osmosis treatments.

125 In this connection, the fermentation range is maintained in the optimum pH and temperature ranges by continuously adding ammonia or ammonia water after a pH value of below about 5 has been reached, in order to achieve a constant neutralization and heating effect from the exothermic reaction and thereby accelerate the fermentation and the NPN synthesis.

126 A fermentation of up to about 50% of the given lactose can easily be achieved, with the result that with normal contents of about 70 to about 75% by weight of lactose in the dry substance in addition to the native proteins of the wheys of about 11.5% dry substance, easily feasible total protein values of (11.5+35=46.5, or 11.5+37.5=49) about 45 to about 50% dry substance can be obtained from the lactic acid residues.

127 By means of all these measures, it is possible to process the amount of whey, depending on the operating situation and desired fodder system, within a day into the feedstuffs according to the invention.

128 Further advantages of the present invention are the following:

129 (1) Environmental problems caused by the occurrence of large amounts of straw, degraded wheys and milk residues and also by residual spent washes from

molasses, vinasses, and after-products from brewing and wood treatment are solved.

130 (2) Capacity and load problems of processing plants for milk residues and seasonal operations involved in green drying are solved.

131 (3) The fodder problems in high yield cattle herds with regard to ration balancing in acetate-forming and propionate-forming agents based on combining raw structure fibres from straw and energy and protein enrichment from the liquid phase by whey, etc., are solved.

132 (4) The economy of the previous utilization of these waste products is improved for all the parties concerned.

DETAILED DESCRIPTION:

1 SPECIFIC DESCRIPTION OF PREFERRED EMBODIMENTS

2 The following examples illustrate the invention.

3 EXAMPLE 1

4 40,000 l of curd acid whey having a density of 1.023 (=40,920 kg), a dry substance content of 5.5% (=2250 kg) and a SH-value of 70.degree. are neutralized with 25% ammonia water (density 0.91, dry content 35% NH.sub.3).

5 The SH-value denotes the Soxhlet-Henkel value, and an SH-value of 42.5.degree. corresponds to 1% lactic acid in the liquid.

6 An SH-value of 70.degree. denotes a lactic acid amount of approximately 29.5% in the whey dry matter; this corresponds to 659 kg of lactic acid. In the neutralization 17 parts by weight of ammonia are used for 90 parts by weight of lactic acid. This corresponds to 659 kg of lactic acid and 125 kg NH.sub.3 =784 kg of ammonium lactate. The protein value of this nonprotein nitrogen source (NPN source) is 0.81=635 kg of protein.

7 In the neutralization of 40,000 l of curd acid whey, 40,920 kg of material are obtained with a content of 2250 kg of dry matter. The dry matter contains 11.5% protein; this corresponds to 259 kg.

8 The dry matter in the whey is thus increased (by NH.sub.3) to 2375 kg; there is now (259+635 kg protein)=894 kg=37.6% protein/dry substance.

9 After neutralization the whey is evaporated in the dairy to a dry solids content of 33% in the concentrate. The concentrate has a density of 1.15 and a pH value of 6.5.

10 Straw is comminuted to an individual particle size of 20 to 50 mm in a green drying plant and when the straw leaves the comminution unit the whey concentrate from the dairy is added thereto in the feed device. The whey concentrate is mixed with straw in a weight ratio of 40:60. The mixture thus obtained is passed to a conveying device in the green drying plant and is dried on the drum at heating gas temperatures in the range from approximately 170.degree. to 220.degree. C. to a residual moisture content of approximately 12%.

11 After the product has been dried it is separated and passed via conventional conveying devices to the press. Cobs having an average diameter of 15 to 30 mm are produced in the press. These cobs can be sent directly to the consumer.

12 The following calculations on a dry substance basis (abbreviated to TS) are used for the mixing of the whey concentrate and the straw in the ratio 40:60:

2375 kg whey-TS	=	40%
3565 kg straw-TS	=	60%
5940 kg mixture-TS	=	100%

13 Since straw contains about 89% TS, approximately 4000 kg of straw are required.

14 The end product obtained has a dry substance content of approximately 90 to 91%, and accordingly 110 kg of cobs are formed from 100 kg of dry substance fed to the plant.

Nutrient substance calculation
Values in the dry substance

Product/Raw material	Protein %	Crude fibre %	Ash %	Fat %	Starch unit
Curd acid neutralized whey	37.8	--	8.5	1.0	685
Straw, barley summer	4.0	43.4	6.0	1.8	310.sup.+
Product mixture (TS)					
40% whey-TS	15.1	--	3.4	0.4	275
60% straw-TS	2.4	26.1	3.6	1.1	186
100% =	17.5	26.1	7.0	1.5	461
End product (with 91% TS) = cobs approx.	16.0	23-24	7.3	1.3	420
Comparison DGL Standard I	16.0				550

.sup.+ Value according to recent physiological findings

15 EXAMPLES 2 TO 6

16 The procedure is substantially as described in Example 1, various further additives as specified in the following Table being added to the straw-whey mixture.

17 The drying is carried out under the same conditions as in Example 1.

Example	2	3	4	5	6
Components of the mixture					
Straw	70	54	60	50	30
AL-whey (neutralized)					

	15	40	35	25	60
Brewer's yeast	10	--	--	--	--
Brewer's grains	--	--	--	22	--
Vinasse	5	--	1 5	1--	--
Save-all substance	--	3	--	3	8
Fat	--	3	--	--	2

Example	2	3	4	5	6
Proportions of nutrients					
Protein	12.6	16.0	20.0	25.2	30.4
Starch Units	415	465	480	495	580
Crude fibres	24.0	20.0	18.0	15.0	12.0
Crude ash	6.0	6.5	7.0	8.8	6.5
Fat	1.3	4.0	1.5	0.5	3.0
Raw material costs (excluding drying costs)					
DM %	21.50	21.80	22.50	18.75	32.95
Comparison Cost price for the consumer for					
DGL standard		I	II	III	IV
DM %		52.75	54.00	59.75	64.00

18 To produce feedstuffs that contain additives, e.g., minerals, trace elements or vitamins, these additives can be added to the whey concentrate.

19 EXAMPLE 7

20 145 kg of maize-husk-spadix mixture of 50% by weight residual moisture is mixed with 80 kg of concentrated milk residue of 65% by weight residual moisture. The product obtained is dried in a green drying plant and compressed into cobs in a manner known per se.

21 The product obtained has a dry mass 72% of which is derived from the maize plant and 28% from the milk residue.

22 It contains in all 20.1% total protein, 6.1% thereof being derived from the maize and 14.0% from the milk residue. The energy content amounts to 660 STE, 468 STE being from the maize plant and 192 STE from the milk residue. The crude maize fibres amount to 11%. The product obtained is comparable with the feed concentrate for dairy cattle according to DGL Standard II.

23 EXAMPLES 8 TO 10

24 The procedure as described in Example 7 is followed. The amounts used and results obtained are given in the following Table.

Examples	8	9	10
Moist material amounts before			

	drying, from maize-husk-spadix mixed with		
	Protein-milk	residue	Protein-vinasse
Maise-husk-spadix (50% residual moisture)	120	162	145 kg
Milk residues, concentrated (65% residual moisture)	115(100)	--	-- kg(L)
Vinasses (30% residual moisture)	--	27(22)	39(31) kg(L)
	Dry matter composition in the end product after drying and pressing		
Dry matter amounts			
Maize plant	60	81	73%
Milk residues	40	--	--
Vinasses	--	19	27
Crude protein amounts			
from maize	5.1	6.9	6.2%
from milk residue	20.0	--	--
from vinasses	--	13.1	18.6
giving a total protein content of	25.1	20.0	24.8%
Energy amounts			
from maize plant	390	526	475 STE
from milk residue	274	--	--
from vinasses	--	111	158
giving a total energy of	664	637	653 STE
Crude fibre from maize	9.0	12.2	11.0%
comparable with feed concentrate for dairy cattle according to DGL Standard	III	II	III

25 The following is a Comparative Experiment:

26 A cylindrical glass having a diameter of 100 mm and a height of 180 mm which has a calibration marking at the 1000 ml level is used. 25 grams of feed pellets to be tested are deposited into the glass and the glass filled to the 1000 ml calibration mark with hot water at 75.degree. C. In such test, if the tested feed possesses structure, such structured material would then float on the water. Such structured material is then collected with the aid of a sieve, and spread on blotting paper to be dried. Thereafter, the structured material is measured.

27 With a feed of the present invention, a visible band of straw particles is formed after dissolution of the feed in the warm water. At the the same time, the other particles sink as a sediment. The structured particles are recovered and their length may be measured. The length thus measured coincides exactly with the values given hereinbefore, i.e., 1 to 16 cm. After drying on the blotting paper, the structured fibers are weighed. Their weight is at least 75% by weight.

28 With a conventionally produced feed, i.e., that available in the market, and having no structure, a temporary light band is visible, which then sinks to the bottom. No structured material can be recovered, dried and weighed.

29 SUMMARY

30 From the foregoing description, one skilled in the art can easily ascertain the essential characteristics of this invention, and without departing from the spirit and scope thereof, can make various changes and modifications of the invention to adapt it to various usages and conditions. Consequently, such changes and modifications are properly, equitably, and "intended" to be, within the full range of equivalence of the following claims.

CLAIMS:

I claim:

1. An animal feedstuff in pressed form compressed at a pressure less than 700 atmospheres to a bulk density of about 0.3 to about 1.3 g/ml based on solid, fibrous, agricultural by-products comprising:

(a) from about 25 to about 95% by weight dry matter of at least one comminuted, solid, structured fibrous, agricultural by-product, having a low nutritional value and selected from the group consisting of cereal straw, leguminous straw, maize columellae, maize-husk-spadix grist, feedstuff cereal mixture, flax plant chaff, flax plant capsules, fibrous fruit peel, fibrous fruit skin and malt sprouts, said agricultural by-product having a length of about 10 to about 160 mm; and

(b) from about 75 to about 5% by weight dry matter of at least one digestible, non-structured, industrial by-product or residue with nutrient value, selected from the group consisting of whey, protein-enriched residues from milk treatment processes, molasses residues, vinasse, .alpha.-celluloses, starch, brewer's yeast, brewer's grains, brewing residues, distillery residues, fermentation residues, dregs, kieselguhr residues, and chitin;

(c) said feedstuff in said pressed form having a moisture content of about 8 to about 14% by weight; the structured agricultural by-product in said feedstuff in said pressed form still retaining its structured integrity, thereby to provide chewability and bits to said animal feedstuff.

2. The animal feedstuff of claim 1 wherein said pressed feedstuff is in the form of pellets, the diameter of said pellets being between about 14 mm and about 32 mm; the length of said pellets being between about 15 mm and about 50 mm; and the density of said pellets being between about 0.8 and about 1.3.

3. The animal feedstuff of claim 1 wherein said pressed feedstuff is in the form of pellets, the diameter of said pellets being about 18 mm and about 24 mm; wherein the length of said pellets is between about 25 mm to about 45 mm; and wherein the density of said pellets is between about 0.7 and 0.85.

4. The animal feedstuff of claim 1 wherein said component (a) comprises cereal straw; and wherein said component (b) comprises whey.

5. The animal feedstuff of claim 1 wherein said component (a) comprises from about 25% to about 85% by weight dry matter of at least one material selected from the group consisting of cereal straw and leguminous straw; and wherein said component (b) comprises from about 75% to about 20% by weight dry matter of by-product whey.

6. The animal feedstuff of claim 1 wherein said component (a) comprises about 50% by weight dry matter straw; wherein said component (b) comprises about 25% by weight dry matter neutralized by-product whey; and including (c) about 22% by weight dry matter by-product brewer's grains; and (d) about 3% by weight .alpha.-cellulose.

7. The animal feedstuff of claim 1 wherein said component (a) comprises from about 25% to about 95% by weight dry matter of at least one material selected

from the group consisting of cereal straw and leguminous straw; and wherein said component (b) comprises from about 75% to about 5% by weight dry matter selected from the group consisting of whey and brewer's grains.

8. The animal feedstuff of claim 1, wherein components (a) and (b) are so selected as to comprise:

straw	about 35% to about 50% by dry weight matter
low lactose, protein-enriched whey	about 15% to about 36% by dry weight matter
a digestible, industrial by-product or residue with nutrient value selected from the group consisting of .alpha.-cellulose and chitin and mixtures thereof	about 2% to about 10% by dry weight matter
vinasses	about 2% to about 10% by dry weight matter
non-dried brewer's grains	about 20% to about 35% by dry weight matter
mineral substances and conventional additives selected from the group consisting of antibiotics, enzymes hormones, trace elements, vitamins, pharmaceuticals, and prervatives and mixtures thereof.	up to about 2% by dry weight matter

9. The animal feedstuff of claim 1 wherein said fibrous fruit peel is selected from the group consisting of citrus fruit peel, and banana peel, and mixtures thereof.

10. The animal feedstuff of claim 1 and further including about 5% to about 20% by weight dry matter of concentrated brewer's yeast and about 1% to about 4% by weight dry matter of a compound selected from the group consisting of fats and fatty acids and mixtures thereof.

11. A process for the production of an animal feedstuff as claimed in claim 1 from solid, fibrous, agricultural by-products, said process comprising the steps of:

(a) intensively mixing (i) from about 25% to about 95% by weight dry matter of at least one comminuted, solid, structured fibrous agricultural by-product having a low nutritional value and length in the range between about 10 and about 160 mm, said agricultural by-product being selected from the group consisting of cereal straw, leguminous straw, maize collumellae, maize-husk-spadix grist, feedstuff cereal mixture, flax plant chaff, flax plant capsules, fibrous fruit peel, fibrous fruit skin and malt sprouts, with (ii) from about 75% to about 50% by weight dry matter of at least one water-containing digestible, non-structured industrial by-product or residue with nutrient value, selected from the group consisting of whey, protein-enriched residues from milk processes, molasses residues, vinasse, molasses residues, .alpha.-cellulose, starch, brewer's yeast, brewer's grains,

brewing residues, distillery residues, fermentation residues, dregs, kieselguhr residues, and chitin;

(b) partially drying the mixture thereby obtained to a moisture content of about 8% to about 14% by weight; and

(c) processing said mixture into a compressed product by compression at a maximum pressure of 700 atmospheres, to provide a pressed pellet of bulk density of 0.3 to 1.38 g/ml and a moisture content of about 8 to about 14% by weight in which the structured integrity of said agricultural by-product is maintained; thereby to provide chewability and bite to said animal feedstuff.

12. The process of claim 11 wherein said processing step comprises compressing said partially dried mixture under moderate pressure, thereby to provide an animal feedstuff in pelleted form, the diameter of said pellets being between about 14 mm and about 32 mm; the length of the pellets being between about 15 mm and about 50 mm; and the density of said pellets being about 0.8 and about 1.3.

13. The process of claim 11, wherein said processing step comprises compressing said partially dried mixture under moderate pressure, thereby to provide an animal feedstuff in pelleted form, the

diameter of said pellets being between about 18 mm and about 24 mm; the length of the pellets being between about 25 mm to about 45 mm; and the density of said pellets being between about 0.7 and 0.85.

14. The process of claim 11 wherein said processing step is carried out by the combination of a metering screw and a press where the partially dried material is formed into compressed fodder at moderate pressure substantially less than 7000 atmospheres.

15. A process for the production of an animal feedstuff as claimed in claim 11 wherein step (a) comprises: intensively mixing (i) about 25% to about 80% by weight dry matter of at least one material selected from the group consisting of cereal straw and leguminous straw having a length of about 120 to 160 mm with (ii) about 75% to about 20% by weight of by-product whey; wherein step (b) comprises: partially drying the mixture thereby obtained; and wherein step (c) comprises compresing the mixture into an animal feedstuff while essentially retaining the length characteristic and structured integrity of said fibrous cereal straw or leguminous straw.

16. The process of claim 11 wherein said partial drying step is carried out in a green fodder drying plant.

17. The process of claim 11 wherein said partially drying step is carried out in a slurry drying plant.

18. The process of claim 11 including the step of adding sufficient water prior to or during step (a) to ensure intensive mixing of said fibrous by-product and said other by-product.

19. The process of claim 11 including the further step prior to or during step (a) of the addition of chitin.

L12: Entry 4 of 5 File: USPT Mar 29, 1977

DOCUMENT-IDENTIFIER: US 4015018 A
TITLE: Silage process and product

Abstract Text (1):
Forage crops such as perennial grasses, alfalfa, corn and sorghum in the wet or moist state are chopped into small pieces, a quantity of a composition consisting essentially of sodium diacetate and dehydrated whey is added, and the resultant mixture is placed in a storage container such as a silo and allowed to ferment to produce silage which is useful as an animal feed, especially for ruminant animals such as beef and dairy cattle.

Brief Summary Text (4):
When forage crops are placed in the silo, sugars from these plants are converted by yeast organisms to carbon dioxide and water, along with heat production. Due to the limited oxygen supply in the silo, some of the sugars are converted to ethyl alcohol which in turn is oxidized to acetic acid due to the presence of acetic acid producing bacteria.

Brief Summary Text (6):
Coincidental with the production of acetic acid by one or more types of bacteria, other types of bacteria produce lactic acid from the plant sugars.

Brief Summary Text (12):
Still a further object of the invention is to produce new and improved animal feeds containing silage which are especially useful in feeding beef and dairy cattle and other ruminants and which, when fed to dairy cattle, enhance milk production. Other objects will appear hereinafter.

Brief Summary Text (14):
In accordance with the invention forage crops such as perennial grasses of the type previously described with or without corn stalks are chopped into small pieces while they are still in green state and before any substantial amount of normal drying has taken place, and intimately mixed with a composition of sodium diacetate and dehydrated whey in synergistic proportions and then fermented in a silo or other storage container, the quantity of the sodium diacetate and whey composition being sufficient to inhibit protein reduction during the fermentation and also to inhibit the formation of undesirable butyric acid, thereby producing a silage product after the completion of the fermentation which has enhanced protein availability and enhanced nutritive value, especially for use as an animal feed in feeding beef cattle, dairy cattle, sheep and other ruminant animals.

Brief Summary Text (16):
Sodium diacetate is non-toxic to man or animals since it metabolizes directly to carbon dioxide and water, leaving no residue in the tissues. It is not corrosive to equipment and may be safely handled by human beings using ordinary precautions.

Brief Summary Text (17):
A most important feature of sodium diacetate is that it does inhibit mold without inhibiting the desirable bacteria and yeast activity. Similarly, and equally important, sodium diacetate provides additional acetic acid on hydrolysis, thereby adding a desirable compound to the silage. It has been shown that the acetic acid molecule is an important molecule during the manufacture of butterfat in the

biochemical processes of the mammary glands of the cow.

Brief Summary Text (20):
As previously pointed out, silage can be made from a variety of green plant substances cut before any natural drying has taken place. The cut materials are chopped into small pieces and conveyed into a silo or storage container where fermentation takes place. During this fermentation, both acetic and lactic acids are produced by bacterial organisms which are present on the green plant materials. These organisms convert natural sugars into some ethyl alcohol, carbon dioxide, and acetic and lactic acids.

Brief Summary Text (21):
Sodium diacetate in combination with whey provides an ideal combination of chemical substances to aid the fermentation and to make more of the essential nutritive acetic acid and to make quantities of acetic and lactic acid at an earlier stage in the fermentation process to prevent the formation of the undesirable butyric acid. There is some indication that sodium diacetate reacts with the lactose of the whey to manufacture additional lactic acid.

Brief Summary Text (23):
Of the above ingredients, sodium diacetate and whey are the only effective components in the silage-making process. Calcium carbonate and bentonite are antihumectants for sodium diacetate and the whey. They act as free-flowing agents permitting easy distribution. The coconut oil or mineral oil is an anti-dusting factor. Other anti-humectants and other anti-dusting factors which are chemically inert and edible as well as non-toxic can be employed. In general, the sodium diacetate will comprise 40-75% by weight of the additive composition and the weight ratio of sodium diacetate to dehydrated whey will be within the range of 7.5:1 to 1:4. The amount of dehydrated whey is preferably at least 15% by weight of the composition and the amount of inert ingredients preferably does not exceed 15% by weight of the composition.

Brief Summary Text (24):
In order to evaluate the invention, tests were made to demonstrate that additive compositions of the type described when added to silage materials prior to fermentation produce a very desirable effect on the finished silage by raising the level of protein available to animals through their digestive processes. As reported by H. Crowley in the 1972 Edition of the "Dairy Feeding Handbook": "The cell contents of vegetable materials are easily soluble starches, sugars, and proteins and small amounts of soluble minerals, vitamins, and fats. Essentially all of these nutrients within the cell are digested and used by either ruminants or non-ruminant animals. The cell-wall contents are generally less available but may be used by ruminants. Part of the cellulose and hemicellulose of the cell walls may be digested. However, the degree of digestibility depends on other factors in the feed."

Brief Summary Paragraph Table (2):
TABLE I

Ingredients Per Cent by Weight

Sodium diacetate 50.0% Sprayed-dried whey 35.3% Calcium carbonate 8.2% Bentonite (a silicate compound) 5.0% Mineral or Coconut Oil 1.0% Zeolex (sodium aluminosilicate anti-caking agent) .50% 100.00%

Detailed Description Text (3):
This example shows a comparison of protein available in freshly chopped untreated silage made from grasses and silage treated prior to fermentation with 3 pounds of an additive composition containing sodium diacetate and dehydrated whey, together with anti-humectants and an anti-dusting factor in the proportions in the typical composition previously given.

Detailed Description Text (4):
The factor shown as "Availability Rating" demonstrates that due to the heat developed during the silage-making process, the protein becomes more tightly

attached to the fiber thereby reducing the availability of the protein. Sodium diacetate and whey provide a chemical mechanism which significantly increases the protein availability.

Detailed Description Text (6):
The data in Table II show that the presence of the sodium diacetate -whey additive during the fermentation of the silage increase the Protein Availability Rating by 11%. Expressed in another way, the presence of the sodium diacetate -whey additive prevented the decrease of protein available occurring in natural fermentation by 11%.

Detailed Description Text (9):
A similar number of silage tests in which the sodium diacetate -whey composition was added at the rate of 3 pounds per ton showed a Protein Availability Rating in the finished silage of 79%. Thus, it is apparent that the presence of the sodium diacetate -whey composition inhibited the Protein Availability Rating against the severe drop shown by the untreated silage tests.

Detailed Description Text (12):
A dairy cow eating each of the above two silage feeds for equivalent periods of time would produce 4-5 lbs. more milk per day when eating the sodium diacetate -whey additive treated feed. This is based on the fact that the treated silage would have 3.9 lbs. of available crude protein per 30 lbs. of silage (dried basis), as opposed to only 3.5 lbs. of available protein in the untreated silage.

Detailed Description Text (13):
The milk production per pound of feed per cow per day as influenced by the amount of sodium diacetate added to the silage should be in the range of 0.5 to 20 lbs. of sodium diacetate per ton of silage. Four pounds of sodium diacetate per ton would be 1 lb. of sodium diacetate per 480 lbs. of feed.

Detailed Description Text (16):
In the foregoing examples the quantity of the sodium diacetate -whey composition can be varied. In most cases on all silages (corn, grass, legume, oats) satisfactory results are obtained at just 1 lb. of the sodium diacetate -whey composition per ton of silage which corresponds to 0.05% of sodium diacetate . For high moisture grains at 25-35% moisture the rate of application of the sodium diacetate -whey composition is preferably 2 lbs. per ton. In general, the quantity of sodium diacetate added in making the silage is within the range of 0.5 to 20 lbs. per ton of silage which corresponds to 0.025 to 1% by weight of the silage.

Detailed Description Text (17):
The sodium diacetate -whey composition can be added with a mechanical applicator at a blower or spread evenly on the bottom of the chopper box or on top of the load, or in any other suitable manner. Silage crops are preferably placed in the silo immediately after chopping and the sodium diacetate -whey composition is added either before or after the silage crops are placed in the silo. Uniform or even distribution of the added sodium diacetate -whey composition is desirable. The last loads into the silo should be higher in moisture to allow for more compaction. This reduces air space, a cause of spoilage. The load should be covered with a plastic sheet after the silo is filled.

Detailed Description Paragraph Table (2):
TABLE III Harvested Feed Value After Feed Value Description Silo Processing Per Ton Untreated - 60% Moisture 89% $66.64 Fermented Silage at 16% Protein Sodium Diacetate -Whey 98% $73.50 additive Treated- 65% Moisture Fermented Silage at 16% Protein

CLAIMS:

1. A process of making silage which comprises intimately mixing with moisture-containing chopped vegetation from which the silage is produced a quantity of sodium diacetate and dehydrated whey in synergistic proportions, and fermenting the resultant mixture, the proportions of sodium diacetate and dehydrated whey being

sufficient to enhance the protein availability of the finished silage.

4. A process as claimed in claim 1 in which the quantity of sodium diacetate is within the range of 0.5 pound to 20 pounds per ton of silage and the dehydrated whey is at least 15% by weight of the total sodium diacetate and whey.

5. A composition for use in making silage consisting essentially of a mixture of sodium diacetate and dehydrated whey in which the quantity of sodium diacetate comprises 40 to 75% by weight and the quantity of dehydrated whey is at least 15% by weight, the remainder being inert ingredients which have no substantial effect on the silage process when the composition is used in making silage.

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L3: Entry 8 of 8 File: DWPI Jul 6, 1982

DERWENT-ACC-NO: 1982-61547E
DERWENT-WEEK: 198229

TITLE: Animal feed contg. sodium di:acetate as attractant - and to enhance taste threshold

INVENTOR: ANDERSON, P W; GLABE, E F ; LAFSIDIS, S

PRIORITY-DATA: 1981US-0287198 (July 27, 1981), 1971US-0158616 (June 30, 1971), 1972US-0300736 (October 25, 1972), 1974US-0484080 (June 28, 1974), 1975US-0630697 (November 10, 1975), 1977US-0841913 (October 13, 1977), 1979US-0090241 (November 1, 1979)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
US 4338336 A	July 6, 1982		004	

INT-CL (IPC): A23K 1/14

ABSTRACTED-PUB-NO: US 4338336A
BASIC-ABSTRACT:

An animal feed for cattle, pigs, goats, horses, sheep and fowl comprises sodium diacetate (I) as an attractant and to enhance the taste threshold of the feed. Pref. amt. of (I) is 0.05-1.5% on wt. of total fedd, esp. upto 0.2%. (I) may also be used in feeds contg. roughage. Pref. feed components are corn, hay, alfalfa, corn silage, soyabean meal, meat meal, fish meal, dehydr dehydrated alfalfa meal, minerals and vitamins.

Addn. of (I) can be used to encourage the animals to accept dry feed or e.g. to hasten weaning of piglets to make it possible for the sows to have 3 litters per year instead of 2. (I) may be used to increase the feed intake and increase the weight so that the animals may be brought to market at an earlier date. (I) also enhances the storage stability of the feed which thus retains its attractiveness over a longer period. (I) is esp. useful when applied to corn of moisture content 16-35% which is susceptible to mould on storage, since it inhibits mould formation under typical farm storage conditions. In tests, diary cows show increased milk prodn. when the feed contains (I).

ABSTRACTED-PUB-NO: US 4338336A
EQUIVALENT-ABSTRACTS:

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L4: Entry 26 of 32 File: USPT Apr 5, 1977

US-PAT-NO: 4016294
DOCUMENT-IDENTIFIER: US 4016294 A

TITLE: Animal feeds for herbivorous domestic animals

DATE-ISSUED: April 5, 1977

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Glabe; Elmer F.	Northbrook	IL		
Anderson; Perry W.	Niles	IL		
Laftsidis; Stergios	Chicago	IL		

US-CL-CURRENT: 426/72; 426/331, 426/532, 426/534, 426/74, 426/807, 514/578

CLAIMS:

We claim:

1. An animal feed for herbivorous animals selected from the group consisting of cattle, pigs, horses, sheep, goats and fowl containing sodium diacetate added thereto in sufficient amount to serve as an attractant and to enhance the taste threshhold of said feed, the amount of sodium diacetate being within the range of 0.1% to 1.5% by weight of the total feed, and said feed to which said sodium diacetate is added being selected from the group consisting of corn and mixed feeds containing at least 25% by weight of corn wherein said sodium diacetate is present in the endosperm of the corn.

2. An animal feed as claimed in claim 1 which contains ground corn and a substance selected fron the group consisting of alfalfa meal, soybean meal, vitamins and minerals.

3. A feed as claimed in claim 1 in which said sodium diacetate is added to the corn component of said feed while the corn is in the form of whole kernels containing a natural moisture content of 16% to 35% by weight without artificial drying, the corn being allowed to remain in contact with the sodium diacetate until the sodium diacetate has penetrated the seed coat to the endosperm.

4. An animal feed as claimed in claim 3 in which the corn containing sodium diacetate in the endosperm is ground.

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L2: Entry 4 of 9 File: USPT Apr 1, 1980

US-PAT-NO: 4196194
DOCUMENT-IDENTIFIER: US 4196194 A

TITLE: Feeding dairy cattle

DATE-ISSUED: April 1, 1980

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Glabe; Elmer F.	Northbrook	IL		
Rebhan; Herbert J.	New Richmond	WI		

US-CL-CURRENT: 514/21; 426/2, 426/807

CLAIMS:

The invention is hereby claimed as follows:

1. A process of feeding dairy cattle which comprises feeding dairy cattle with a quantity of sodium diacetate and dehydrated whey mixed together and fed as a feed additive as such or in a mixed feed, in sufficient proportions to enhance the milk production of such cattle, the quantity of sodium diacetate being within the range of 0.025% to 0.25% by weight of the feed and the quantity of dehydrated whey being at least 4% by weight of the total sodium diacetate and whey, the weight ratio of sodium diacetate to dehydrated whey being within the range of 25:1 to 1:4.

2. A process as claimed in claim 1 in which the sodium diacetate and dehydrated whey mixed together are added to a mixed feed eaten by said cattle.

3. A process as claimed in claim 1 in which the sodium diacetate and dehydrated whey mixed together in pellet or cake form is fed to the cattle separately or in the grain portion of cattle feed.

4. A process as claimed in claim 1 wherein said sodium diacetate and said dehydrated whey additive are added to the feed fed to said cattle as a mixture in which the quantity of sodium diacetate is 20-75% by weight and the quantity of dehydrated whey is at least 3% by weight, the remainder being edible inert substances that have no substantial effect in enhancing the milk production of the cattle.

5. A process as claimed in claim 4 wherein the quantity of sodium diacetate is approximately 50% by weight and the quantity of dehydrated whey is approximately 35% by weight of said mixture.

6. A process as claimed in claim 4 wherein the quantity of sodium diacetate is approximately 50% of said mixture and the quantity of dehydrated whey is approximately 13-14% by weight of said mixture.

7. A process as claimed in claim 4 wherein the quantity of sodium diacetate is approximately 50% of said mixture and the quantity of dehydrated whey is approximately 3-4% by weight of said mixture.

8. Dairy cattle feed consisting essentially of at least one ingredient selected from the group consisting of hay, haylage, corn silage and grain to which has been added a mixture of a quantity of sodium diacetate and dehydrated whey in synergistic proportions sufficient to enhance milk production when fed to dairy cattle, the quantity of sodium diacetate being within the range of 0.025% to 0.25% by weight of the feed and the quantity of dehydrated whey being at least 4% by weight of the total sodium diacetate and whey, the weight ratio of sodium diacetate to dehydrated whey being within the range of 25:1 to 1:4.

9. A dairy cattle feed as claimed in claim 8 wherein said cattle feed comprises grain to which said mixture of sodium diacetate and dehydrated whey has been added.

10. A dairy cattle feed as claimed in claim 8 wherein the quantity of sodium diacetate is approximately 0.075% by weight of said feed.

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L3: Entry 4 of 8 File: USPT Jul 17, 1979

US-PAT-NO: 4161543
DOCUMENT-IDENTIFIER: US 4161543 A

TITLE: Feeding herbivorous animals

DATE-ISSUED: July 17, 1979

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Glabe; Elmer F.	Northbrook	IL		
Anderson; Perry W.	Niles	IL		
Laftsidis; Stergios	Chicago	IL		

US-CL-CURRENT: 426/2; 426/650, 426/807, 514/578

CLAIMS:

The invention is hereby claimed as follows:

1. A process of feeding herbivorous animals from the group consisting of beef cattle, dairy cattle, sheep, goats, horses, hogs and fowl which comprises feeding such animals with feeds normally eaten by such animals and sodium diacetate in sufficient amounts to serve as an attractant to such animals for such feeds and to enhance the taste threshold.

2. A process as claimed in claim 1 in which said animals are beef cattle.

3. A process as claimed in claim 1 in which said animals are dairy cattle.

4. A process as claimed in claim 1 in which said animals are hogs.

5. A process as claimed in claim 1 in which the amount of sodium diacetate is at least 0.025% of the food intake of such animals.

6. A process as claimed in claim 1 in which the food eaten by such animals contains roughage.

7. A process as claimed in claim 1 in which said animals are fowl.

8. A process as claimed in claim 1 in which sodium diacetate is fed to such animals as such either in solid form or as a solution in water.

9. A process as claimed in claim 1 in which said animals are turkeys.

10. A process as claimed in claim 1 in which said animals are chickens.

11. A process as claimed in claim 1 in which the amount of sodium diacetate is within the range of 0.025% to 0.35% by weight of said feed.

12. A process as claimed in claim 1 in which the amount of sodium diacetate is sufficient to increase the feed efficiency of said feed.

13. A process as claimed in claim 1 in which said feed is a feed eaten by dairy cows and the amount of sodium diacetate is sufficient to increase the milk production of said cows.

14. A process as claimed in claim 1 in which said feed is a feed eaten by hogs and the amount of sodium diacetate is sufficient to increase the feed efficiency of said feed.

15. A process of feeding herbivorous animals from the group consisting of beef cattle, dairy cattle, sheep, goats, horses, hogs and fowl which comprises feeding such animals with feeds normally eaten by such animals and 0.025% to 0.35% by weight of sodium diacetate, based on the weight of such feeds, said amount being sufficient to serve as an attractant to such animals for such feeds, said feeds including one or more of the following: cereal grains, hay, hay silage, corn silage, sorgham silage, alfalfa meal, soybean meal, linseed meal, sunflower seed meal, cane molasses, meat and bone meal, fish meal, spent brewer's wet grains, fermentation solubles, corn distillers dried grains, corn distillers dried solubles, dried whey, dried fermented corn extractives, with or without crude protein, minerals, vitamins and antibiotics.

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L3: Entry 3 of 8 File: USPT Jul 6, 1982

US-PAT-NO: 4338336
DOCUMENT-IDENTIFIER: US 4338336 A
**** See image for Certificate of Correction ****

TITLE: Animal feeds for herbivorous animals

DATE-ISSUED: July 6, 1982

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Glabe; Elmer F.	Northbrook	IL		
Anderson; Perry W.	Niles	IL		
Lafsidis; Stergios	Chicago	IL		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Food Technology Products	Chicago	IL			02

DISCLAIMER DATE: 19921209

APPL-NO: 06/ 287198 [PALM]
DATE FILED: July 27, 1981

PARENT-CASE:
RELATED CASES This application is a continuation of U.S. application Ser. No. 90,241 filed Nov. 1, 1979, abandoned; which is a continuation of U.S. application Ser. No. 841,913, filed Oct. 13, 1977, abandoned; which is a continuation of U.S. application Ser. No. 630,697 filed Nov. 10, 1975, abandoned; which is a continuation-in-part of U.S. application Ser. No. 484,080 filed June 28, 1978, which issued as U.S. Pat. No. 3,925,559 on Dec. 9, 1975 which is a continuation-in-part of U.S. application Ser. No. 300,736 filed Oct. 25, 1972, now abandoned, which is a continuation-in-part of application Ser. No. 158,616 filed June 30, 1971, now abandoned.

INT-CL: [03] A23K 1/14, A23K 1/10

US-CL-ISSUED: 426/1; 426/635, 426/807
US-CL-CURRENT: 426/1; 426/635, 426/807

FIELD-OF-SEARCH: 424/317, 426/2, 426/93, 426/96, 426/89, 426/102, 426/289, 426/294, 426/295, 426/321, 426/331, 426/54, 426/335, 426/532, 426/533, 426/534, 426/618, 426/636, 426/650, 426/654, 426/807

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected Search ALL

	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
☐	2609298	September 1952	Kirby	426/534
☐	3457081	July 1969	Freese	426/54
☐	3672914	June 1972	Delaney	426/534
☐	3925559	December 1975	Glabe et al.	426/807

OTHER PUBLICATIONS

Feeds and Feeding, Morrison 22nd Ed., Morrison Pub. Co., 1957, 452, 453.

ART-UNIT: 177

PRIMARY-EXAMINER: Bernstein; Hiram

ATTY-AGENT-FIRM: Johnston; Richard L.

ABSTRACT:

Animal feeds for herbivorous animals from the group consisting of cattle, pigs, horses, sheep, goats and fowl are provided containing the feed ingredients normally eaten by such animals and sodium diacetate intimately mixed therewith in sufficient amount to serve as an attractant and to enhance the taste thresholds of said feeds.

14 Claims, 0 Drawing figures
Exemplary Claim Number: 1

BRIEF SUMMARY:

1 The subject matter of the present application is also disclosed in part in U.S. application Ser. No. 350,346 filed Apr. 12, 1973, now abandoned; which is a continuation-in-part of U.S. application Ser. No. 158,616 filed June 30, 1971, now abandoned, and U.S. application Ser. No. 613,068, filed Sept. 15, 1975, issued as U.S. 4,016,294 on Apr. 5, 1977, which is a division of Ser. No. 484,080, now U.S. Pat. No. 3,925,559. The subject matter of this application is also divisional with respect to the subject matter of U.S. application Ser. No. 858,660, filed Dec. 8, 1977, now U.S. Pat. No. 4,161,543.

2 BACKGROUND

3 It is known in the art to add various types of flavoring materials to animal feeds of a vegetable nature such as corn, alfalfa meal, soybean meal, and mixtures thereof with or without minerals, vitamins and other additives, e.g., methionine, Vitamin E and Vitamin A. Vanillin and other flavoring substances have also been added. In some cases such additives may improve the odor of the feed but do not necessarily improve its attractiveness to animals such as beef cattle, including calves, dairy cattle, swine, including baby pigs, sheep, including lambs, and goats, including kids. These animals differ from each other in their likes and dislikes and some of them such as cattle, sheep and goats have more than one stomach.

4 It is very difficult during certain times of the year to get animals to eat dry feed and in the case of some animals such as baby pigs, it would be desirable to increase the attractiveness of vegetable type feed so that they can be taken off of sows milk and fed with this type of feed at an earlier date. This would make it possible for the sows to have three litters of pigs a year rather than two.

5 In general, animals which are raised for meat and also dairy cattle are fed two different types of vegetable feed, namely, roughage, including hay and corn silage, and a supplemental ration usually containing corn, alfalfa meal,

soybean meal, minerals and vitamins. In the case of an average dairy cow, for example, this supplemental ration might be within the range of 10 to 20 pounds per day. It can be prepared in the form of a ground mixture with or without pelleting.

6 For various reasons it would be desirable to increase the attractiveness of feeds to animals. One reason is to improve the general health of the animals. Another reason is to increase the feed intake of animals, especially herbivorous animals which are raised to be slaughtered for meat purposes, thereby increasing the weight of the animals and bringing them to market at an earlier date. A principal food of herbivorous animals is corn.

7 OBJECTS

8 One of the objects of the present invention is to provide a new and improved method of feeding herbivorous animals.

9 Another object of the invention is to provide new and improved animal feeds which not only contain an attractant but also are more stable on storage and retain their attractiveness to animals over a substantial period of time.

10 An additional object of the invention is to provide animal feeds in the form of feed supplements which contain an attractant for animals that improves the taste threshold of the feed. Other objects will appear hereinafter.

11 BRIEF SUMMARY OF THE INVENTION

12 In accordance with the invention it has been found that sodium diacetate when fed to herbivorous animals acts as an attractant and enhances the taste threshold. The effective amounts are usually within the range of 0.05% to 1.5% by weight of the food intake and in most cases within the range of 1 to 20 pounds per ton of food intake.

13 DETAILED DESCRIPTION OF THE INVENTION

14 The invention can be practiced in a number of different ways. The sodium diacetate can be added to high moisture corn (approximately 24% moisture) at levels within the range of 0.1% to 1.0% usually 0.3%, 0.6% and 0.9%. Inasmuch as sodium diacetate is a solid material the addition can be carried out in a batch feed mixer. The corn can be stored in open wood bins on a barn floor. Surface air movement will be sufficient to remove moisture produced by sweating of the corn. After the corn has been treated, it can be used as such as an animal feed or it can be stored and used at a later date or it can be mixed with other ingredients such as, for example, alfalfa meal, soybean meal, minerals and vitamins. The resultant mixture can be used as such as an animal feed or it can be pelleted and the pellets employed as an animal feed.

15 One method of preparing pellets is to grind corn, alfalfa meal, soybean meal, minerals and vitamins, add steam to bring the moisture content up to 16% water and then allow the mixture to stand and cool so that the final moisture content is around 14%. Sodium diacetate is added to this mixture either before or after pelleting in proportions sufficient to give a mixed feed containing, for example, 0.2% sodium diacetate, 0.6% sodium diacetate or 1.0% sodium diacetate. Tests have shown that this type of feed is very attractive to cattle. Cattle and hogs are also attracted to treated cereal grains such as treated corn containing sodium diacetate in the quantities indicated with or without the other ingredients used in preparing mixed feeds.

16 The sodium diacetate is preferably added to corn in the form of whole kernels containing their natural moisture content as they come from the field (e.g., 18% to 35% by weight) without artificial drying. Before use the corn is allowed to remain in contact with the sodium diacetate until the sodium diacetate penetrates the seed coat to the endosperm. The amounts used are usually within the range of 0.1% to 1.5% by weight and preferably from about 0.8% to 1.5% by weight of sodium diacetate. The corn containing sodium diacetate in the

endosperm can be used as whole kernels or it can be cracked or ground and used as such or in mixed feeds. In case the product is to be used without lengthy storage and the sodium diacetate is employed primarily as an attractant as little as 0.1% to 0.2% of sodium diacetate will be sufficient to increase the taste threshold and make the resultant feed more attractive to animals.

DETAILED DESCRIPTION:

1 The invention will be further illustrated but is not limited by the following examples in which the quantities are given in parts by weight unless otherwise indicated.

2 EXAMPLE I

3 In a comparative palatability study a normal or conventional animal feed supplement containing ground corn, alfalfa meal, soybean meal, minerals and vitamins in the form of pellets about 3/8 inch in diameter and 3/4 inch long was compared with the same animal feed containing various percentages of sodium diacetate in feeding unfed dairy cows. The tests were performed on hungry cows with the first feed in the morning and the same levels were repeated with the afternoon feeding. The feeding trough was divided into two sections, one containing the control pellets without the sodium diacetate and the other containing the same feed concentrate with sodium diacetate.

4 In a test involving 16 dairy cows where the amount of sodium diacetate in the sodium diacetate-containing feed was 1% by weight, 14 of the cows preferred the feed containing sodium diacetate and only 2 preferred the control concentrate. None of the cows left the feeding trough more than 30 minutes in either case. In this test there were no cows that did not show a preference for one type of feed or the other.

5 EXAMPLE II

6 The procedure was the same as in Example I except that the feed concentrate containing the 1% sodium diacetate had been stored for 60 days. In this test 35 dairy cows were fed. 21 of the dairy cows showed a preference for the feed concentrate containing the 1% sodium diacetate, 13 showed a preference for the control concentrate and only one showed no preference. One of the cows left the control concentrate more than 30 minutes and 4 of the cows left the sodium diacetate-containing concentrate more than 30 minutes.

7 EXAMPLE III

8 The procedure was the same as in Example I except that the sodium diacetate-containing pellets contained 0.6% by weight sodium diacetate. In this test there were 19 dairy cows, 5 of them preferred the control concentrate and 10 preferred the feed concentrate containing the sodium diacetate. 4 cows showed no preference. 2 of the cows that preferred the control concentrate left the concentrate more than 30 minutes. None of the cows that preferred the sodium acetate-containing concentrate left the concentrate more than 30 minutes.

9 EXAMPLE IV

10 The procedure was the same as in Example I except that the sodium diacetate-containing feed concentrate contained 0.2% sodium diacetate. In this test there were 18 dairy cows. 5 preferred the control concentrate, 12 preferred the sodium diacetate-containing concentrate and one showed no preference. One of the cows that preferred the control concentrate left the concentrate more than 30 minutes. None of the cows that preferred the sodium diacetate-containing feed concentrate left the concentrate more than 30 minutes.

11 From the tests in Examples I to IV in 88 individual tests 65% of the cows preferred the feed containing sodium diacetate, 28% preferred the control ration and 7% showed no preference.

12 EXAMPLE V

13 The following procedure is used in treating high moisture corn for storage. The grain is cleaned as much as possible and sodium diacetate which is a dry, free-flowing, white powder is mixed with the corn by applying the sodium diacetate to the corn while the corn is passing through a screw conveyor. Aeration is used to reduce the temperature of the corn to 40.degree. F. as soon as possible. The corn at 25% moisture should be stored in bins with aeration capacity of at least one cubic foot per minute per bushel of capacity.

14 The sodium diacetate is applied to the corn at the following rates, depending upon the moisture content of the corn:

Moisture of Corn Percent by Weight	Pounds of Sodium Diacetate per Ton
20-22	8
22-24	10
24-26	12
26-28	14
28-30	16

15 EXAMPLE VI

16 The test was made with beef cattle using untreated corn and corn treated as described in Example V. The corn had been treated in July and stored until October. The treated and untreated corn was placed in troughs so that the cattle could have a preference. The cattle ate all of the treated corn before they ate the untreated corn. These trials were repeated and the same results were observed each time.

17 EXAMPLE VII

18 A high moisture corn treated with sodium diacetate as described in Example V was fed to pigs to determine its acceptability. At that time the finishing pen was being fed shelled corn and pellets in self-feeders. For the test the treated corn was placed in small piles on the feeding floor near the self-feeders. The pigs did not eat any more corn out of the self-feeders until the piles of treated corn had been completely consumed.

19 The invention is therefore particularly important where it is desired to fatten herbivorous animals or maintain their health, especially beef cattle, dairy cattle, hogs, horses, sheep, goats and fowl. As previously indicated, as an attractant good results have been obtained by using the sodium diacetate at a level of 0.05% to 1.5% by weight. The feeds can be mixed and used in a pelleted or unpelleted form. The invention is also especially important where the corn has a moisture content from 16% to 35% and is susceptible to mold and where the feed is to be stored for a period of time.

20 The addition of sufficient sodium diacetate causes penetration of the seed coat by the sodium diacetate into the endosperm of the corn and the formation of mold is inhibited under typical farm storage conditions. Usually the amount of sodium diacetate required to render stored corn kernels impervious to mold growth when applied uniformly to the surface of the kernels where the latter

have a moisture content of 21% to 23% by weight will be around 0.8%. As the moisture content is increased the amount of sodium diacetate is increased approximately 0.06% by weight for every 1% by weight increase in moisture in the corn. Thus, as the amount of corn moisture increases from 22% by weight to 32% by weight, the amount of sodium diacetate would be increased from 0.8% by weight to 1.5% by weight.

21 These amounts of sodium diacetate are higher than the amount of sodium diacetate required to serve as an attractant or to improve the taste threshold in animals but herbivorous animals are attracted to animal feeds containing sodium diacetate at both lower levels and higher levels within the range of 0.05% to 1.5% by weight of sodium diacetate based on the weight of the animal feed.

22 While the invention has been described particularly with respect to the use of sodium diacetate in animal feeds containing corn, the sodium diacetate can also be used as an attractant in roughage such as hay, alfalfa, corn silage and the like, preferably at dosage rates within the range of 1 to 20 pounds per ton. Sodium diacetate can also be added to the animals drinking water, preferably at dosages within the range of 0.5% to 1.5% by weight of sodium diacetate based on the weight of the water. Excellent results are obtained in feeding turkeys using 4 to 5 pounds of sodium diacetate per ton of feed up to ten weeks and then dropping to 2 pounds per ton of feed until the turkeys are ready for market. A typical turkey feed to which sodium diacetate is added comprises approximately 24% crude protein minimum, 2.5% crude fat minimum, and 5.50% crude fiber maximum, and is made from ground corn, soybean meal, meat meal, fish meal, defluorinated phosphate, dehydrated alfalfa meal, calcium carbonate, dicalcium phosphate, with minor percentages of vitamin supplements. These feeds can also be prepared in the form of pellets.

23 Tests in feeding dairy cows with feed containing sodium diacetate over a period of one to two months have shown an increase in milk production as compared with dairy cows which were fed with the same feed without the addition of sodium diacetate.

24 In general, the invention is applicable to both ruminant types of herbivorous animals such as beef cattle, dairy cattle, sheep and goats which have more than one stomach as well as non-ruminant animals such as hogs, horses, turkeys and chickens which have only a single stomach. The sodium diacetate can be added to the feed or to the drinking water of such animals in order to serve as an attractant and to enhance the taste threshold of the feed as well as to maintain their general health.

CLAIMS:

The invention is hereby claimed as follows:

1. An animal feed for herbivorous animals selected from the group consisting of cattle, pigs, horses, sheep, goats and fowl consisting essentially of one or more feed ingredients normally eaten by cattle, pigs, horses, sheeps, goats and fowl, and sodium diacetate intimately mixed with said feed ingredients in sufficient amount to serve as an attractant and to enhance the taste threshhold of said feed.

2. An animal feed as claimed in claim 10 in which the amount of sodium diacetate is within the range of 0.05% to 1.5% by weight of the total feed.

3. An animal feed as claimed in claim 10 which contains roughage.

4. An animal feed as claimed in claim 1 in which the feed ingredients are those normally eaten by a beef animal.

5. An animal feed as claimed in claim 1 in which the feed ingredients are those normally eaten by dairy cows.

6. An animal feed as claimed in claim 1 in which the feed ingredients are those normally eaten by pigs.

7. An animal feed as claimed in claim 1 in which the feed ingredients are those normally eaten by fowl.

8. An animal feed as claimed in claim 1 in which the feed ingredients are those normally eaten by turkeys.

9. An animal feed as claimed in claim 1 in which the feed ingredients are those normally eaten by chickens.

10. An animal feed as claimed in claim 1 in which the quantity of sodium diacetate is up to 0.2% by weight of the total feed.

11. An animal feed for feeding herbivorous animals selected from the group consisting of cattle, pigs, horses, sheep, goats and fowl, said feed consisting essentially of one or more of the ingredients corn, hay, alfalfa, corn silage, soybean meal, meat meal, fish meal, dehydrated alfalfa meal, minerals and vitamins normally eaten by such animals and sodium diacetate intimately mixed with said feed in sufficient amount to serve as an attractant and to enhance the taste threshold of said feed.

12. An animal feed as claimed in claim 11 in which the quantity of sodium diacetate does not exceed 0.2% by weight of the total feed.

13. An animal feed for cattle as claimed in claim 11 in the form of a feed supplement consisting essentially of ground corn, alfalfa meal, soybean meal, minerals and vitamins intimately mixed with sodium diacetate .

14. An animal feed for fowl as claimed in claim 11 consisting essentially of ground corn, soybean meal, meat meal, fish meal, dehydrated alfalfa meal, minerals and vitamins intimately mixed with sodium diacetate .

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L4: Entry 31 of 32 File: DWPI Jul 17, 1979

DERWENT-ACC-NO: 1979-57941B
DERWENT-WEEK: 197931

TITLE: Enhancing the taste threshold of feed for herbivorous animals - by addition of sodium di:acetate to their feed

INVENTOR: ANDERSON, P W; GLABE, E F ; LAFTSIDIS, S

PRIORITY-DATA: 1977US-0858660 (December 8, 1977), 1971US-0158616 (June 30, 1971), 1972US-0300736 (October 25, 1972), 1974US-0484080 (June 28, 1974), 1975US-0630697 (November 10, 1975)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
US 4161543 A	July 17, 1979		000	

INT-CL (IPC): A23K 1/00

ABSTRACTED-PUB-NO: US 4161543A
BASIC-ABSTRACT:

In the feeding of beef cattle, dairy cattle, sheep, goats, horses, hogs or fowl, the improvement comprises the presence in the feed of an amt. of sodium diacetate sufficient to attract the animal to the feed and to enhance the taste threshold. Pref. the amt. present is 0.025-0.35 wt. % of the feed.

The process is esp. useful in the fattening of herbivorous animals which are to be slaughtered for meat purposes and for improving the general health of the animals e.g. to improve the milk yields of dairy cattle. The sodium diacetate retains its attractant properties over a long period of time, and feeds contg. it are storage-stable.

ABSTRACTED-PUB-NO: US 4161543A
EQUIVALENT-ABSTRACTS:

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L4: Entry 32 of 32 File: DWPI Apr 5, 1977

DERWENT-ACC-NO: 1977-27033Y
DERWENT-WEEK: 197715

TITLE: Herbivorous animal feeds contg. sodium diacetate - to increase attractiveness of feed

PRIORITY-DATA: 1975US-0613068 (September 15, 1975), 1971US-0158616 (June 30, 1971), 1972US-0300736 (October 25, 1972), 1974US-0484080 (June 28, 1974)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
US 4016294 A	April 5, 1977		000	

INT-CL (IPC): A23B 7/14; A23K 1/16; A23L 1/30

ABSTRACTED-PUB-NO: US 4016294A
BASIC-ABSTRACT:

Animal feed for herbivorous animals (cattle, pigs, horses, sheep, goats, and fowl) consists of a conventional feed (mixed feeds and is not <25% by wt. corn), and 0.1-1.5% by wt. of Na diacetate (I) (as an attractant).

USES

(I) enhances the attractiveness of corn-based animal feeds by improving the taste threshold of the feed (hence food intake is increased). In addn., the feed is more stable to storage, and retains its attractiveness over long periods of time.

ABSTRACTED-PUB-NO: US 4016294A
EQUIVALENT-ABSTRACTS:

L2: Entry 2 of 9 File: USPT Nov 2, 1982

US-PAT-NO: 4357358
DOCUMENT-IDENTIFIER: US 4357358 A

TITLE: Feedstuff or feedstuff additive and process for its production

DATE-ISSUED: November 2, 1982

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Schanze; Rudolf	D-8430 Neumarkt			DE

US-CL-CURRENT: 426/62; 426/623, 426/636, 426/72, 426/807

CLAIMS:

I claim:

1. An animal feedstuff in pressed form compressed at a pressure less than 700 atmospheres to a bulk density of about 0.3 to about 1.3 g/ml based on solid, fibrous, agricultural by-products comprising:

(a) from about 25 to about 95% by weight dry matter of at least one comminuted, solid, structured fibrous, agricultural by-product, having a low nutritional value and selected from the group consisting of cereal straw, leguminous straw, maize columellae, maize-husk-spadix grist, feedstuff cereal mixture, flax plant chaff, flax plant capsules, fibrous fruit peel, fibrous fruit skin and malt sprouts, said agricultural by-product having a length of about 10 to about 160 mm; and

(b) from about 75 to about 5% by weight dry matter of at least one digestible, non-structured, industrial by-product or residue with nutrient value, selected from the group consisting of whey, protein-enriched residues from milk treatment processes, molasses residues, vinasse, .alpha.-celluloses, starch, brewer's yeast, brewer's grains, brewing residues, distillery residues, fermentation residues, dregs, kieselguhr residues, and chitin;

(c) said feedstuff in said pressed form having a moisture content of about 8 to about 14% by weight; the structured agricultural by-product in said feedstuff in said pressed form still retaining its structured integrity, thereby to provide chewability and bits to said animal feedstuff.

2. The animal feedstuff of claim 1 wherein said pressed feedstuff is in the form of pellets, the diameter of said pellets being between about 14 mm and about 32 mm; the length of said pellets being between about 15 mm and about 50 mm; and the density of said pellets being between about 0.8 and about 1.3.

3. The animal feedstuff of claim 1 wherein said pressed feedstuff is in the form of pellets, the diameter of said pellets being about 18 mm and about 24 mm; wherein the length of said pellets is between about 25 mm to about 45 mm; and wherein the density of said pellets is between about 0.7 and 0.85.

4. The animal feedstuff of claim 1 wherein said component (a) comprises cereal straw; and wherein said component (b) comprises whey.

5. The animal feedstuff of claim 1 wherein said component (a) comprises from about 25% to about 85% by weight dry matter of at least one material selected from the group consisting of cereal straw and leguminous straw; and wherein said component (b) comprises from about 75% to about 20% by weight dry matter of by-product whey.

6. The animal feedstuff of claim 1 wherein said component (a) comprises about 50% by weight dry matter straw; wherein said component (b) comprises about 25% by weight dry matter neutralized by-product whey; and including (c) about 22% by weight dry matter by-product brewer's grains; and (d) about 3% by weight .alpha.-cellulose.

7. The animal feedstuff of claim 1 wherein said component (a) comprises from about 25% to about 95% by weight dry matter of at least one material selected from the group consisting of cereal straw and leguminous straw; and wherein said component (b) comprises from about 75% to about 5% by weight dry matter selected from the group consisting of whey and brewer's grains.

8. The animal feedstuff of claim 1, wherein components (a) and (b) are so selected as to comprise:

straw	about 35% to about 50% by dry weight matter
low lactose, protein-enriched whey	about 15% to about 36% by dry weight matter
a digestible, industrial by-product or residue with nutrient value selected from the group consisting of .alpha.-cellulose and chitin and mixtures thereof	about 2% to about 10% by dry weight matter
vinasses	about 2% to about 10% by dry weight matter
non-dried brewer's grains	about 20% to about 35% by dry weight matter
mineral substances	about 2% to about 5% by dry weight matter
and conventional additives selected from the group consisting of antibiotics, enzymes hormones, trace elements, vitamins, pharmaceuticals, and preservatives and mixtures thereof.	up to about 2% by dry weight matter

9. The animal feedstuff of claim 1 wherein said fibrous fruit peel is selected from the group consisting of citrus fruit peel, and banana peel, and mixtures thereof.

10. The animal feedstuff of claim 1 and further including about 5% to about 20% by weight dry matter of concentrated brewer's yeast and about 1% to about 4% by weight dry matter of a compound selected from the group consisting of fats and fatty acids and mixtures thereof.

11. A process for the production of an animal feedstuff as claimed in claim 1

from solid, fibrous, agricultural by-products, said process comprising the steps of:

(a) intensively mixing (i) from about 25% to about 95% by weight dry matter of at least one comminuted, solid, structured fibrous agricultural by-product having a low nutritional value and length in the range between about 10 and about 160 mm, said agricultural by-product being selected from the group consisting of cereal straw, leguminous straw, maize collumellae, maize-husk-spadix grist, feedstuff cereal mixture, flax plant chaff, flax plant capsules, fibrous fruit peel, fibrous fruit skin and malt sprouts, with (ii) from about 75% to about 50% by weight dry matter of at least one water-containing digestible, non-structured industrial by-product or residue with nutrient value, selected from the group consisting of whey, protein-enriched residues from milk processes, molasses residues, vinasse, molasses residues, .alpha.-cellulose, starch, brewer's yeast, brewer's grains, brewing residues, distillery residues, fermentation residues, dregs, kieselguhr residues, and chitin;

(b) partially drying the mixture thereby obtained to a moisture content of about 8% to about 14% by weight; and

(c) processing said mixture into a compressed product by compression at a maximum pressure of 700 atmospheres, to provide a pressed pellet of bulk density of 0.3 to 1.38 g/ml and a moisture content of about 8 to about 14% by weight in which the structured integrity of said agricultural by-product is maintained; thereby to provide chewability and bite to said animal feedstuff.

12. The process of claim 11 wherein said processing step comprises compressing said partially dried mixture under moderate pressure, thereby to provide an animal feedstuff in pelleted form, the diameter of said pellets being between about 14 mm and about 32 mm; the length of the pellets being between about 15 mm and about 50 mm; and the density of said pellets being about 0.8 and about 1.3.

13. The process of claim 11, wherein said processing step comprises compressing said partially dried mixture under moderate pressure, thereby to provide an animal feedstuff in pelleted form, the

diameter of said pellets being between about 18 mm and about 24 mm; the length of the pellets being between about 25 mm to about 45 mm; and the density of said pellets being between about 0.7 and 0.85.

14. The process of claim 11 wherein said processing step is carried out by the combination of a metering screw and a press where the partially dried material is formed into compressed fodder at moderate pressure substantially less than 7000 atmospheres.

15. A process for the production of an animal feedstuff as claimed in claim 11 wherein step (a) comprises: intensively mixing (i) about 25% to about 80% by weight dry matter of at least one material selected from the group consisting of cereal straw and leguminous straw having a length of about 120 to 160 mm with (ii) about 75% to about 20% by weight of by-product whey; wherein step (b) comprises: partially drying the mixture thereby obtained; and wherein step (c) comprises compresing the mixture into an animal feedstuff while essentially retaining the length characteristic and structured integrity of said fibrous cereal straw or leguminous straw.

16. The process of claim 11 wherein said partial drying step is carried out in a green fodder drying plant.

17. The process of claim 11 wherein said partially drying step is carried out in a slurry drying plant.

18. The process of claim 11 including the step of adding sufficient water prior to or during step (a) to ensure intensive mixing of said fibrous by-product and

said other by-product.

19. The process of claim 11 including the further step prior to or during step (a) of the addition of chitin.

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DB=USPT,PGPB,JPAB,EPAB,DWPI; PLUR=YES; OP=ADJ			
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L3	l1 and L2	8	L3
L2	(milk adj3 production) and (sodium diacetate)	9	L2
L1	animal adj feed	18311	L1

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L3: Entry 5 of 8 File: USPT Jul 5, 1977

US-PAT-NO: 4034117
DOCUMENT-IDENTIFIER: US 4034117 A
**** See image for Certificate of Correction ****

TITLE: Process for preparing forage crop animal feeds

DATE-ISSUED: July 5, 1977

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Glabe; Elmer F.	Northbrook	IL		

US-CL-CURRENT: 426/335; 426/532, 426/636, 426/807

CLAIMS:

The invention is hereby claimed as follows:

1. A process of treating hay and alfalfa forage crops which consists essentially in cutting and partially drying said crops in the field to a moisture content above 10% but not more than 65% by weight, intimately mixing the resultant forage crops with a quantity of sodium diacetate, and then consolidating the resultant product and storing it at ambient temperatures, the said temperature and moisture conditions being such that said crops when stored at ambient external temperatures in a baled or otherwise consolidated condition will reach an internal temperature of at least 120.degree. F. at which they would normally have to be removed from storage to avoid spontaneous combustion, the quantity of sodium diacetate being sufficient to have a temperature depressing effect when the consolidated product is stored at ambient temperatures so that said internal temperature remains below 120.degree. F.

2. A process as claimed in claim 1 in which the quantity of sodium diacetate is within the range of 0.05% to 1% by weight.

3. A process as claimed in claim 1 in which the quantity of sodium diacetate is within the range of 0.2% to 0.4% by weight.

4. A process as claimed in claim 1 in which the forage crop is hay.

5. A process as claimed in claim 1 in which the forage crop is partially dehydrated alfalfa.